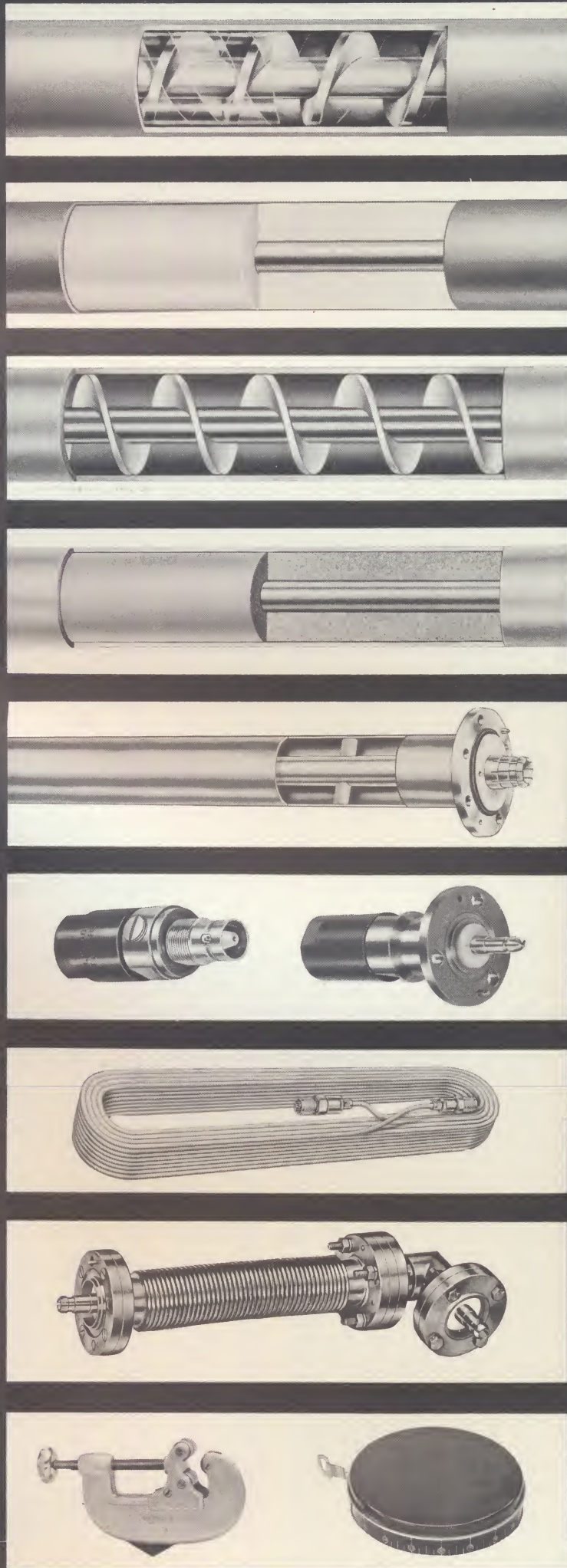


**Coaxial Cable
Connectors
Accessories
Rigid Line
Delay Lines
Coaxial Cable
Assemblies
Systems
Communications
Capability**

PHELPS DODGE ELECTRONIC PRODUCTS
NORTH HAVEN, CONNECTICUT





CAPABILITIES AND INTERESTS

■ Phelps Dodge Electronic Products Corporation is a manufacturing, research, development and engineering organization uniquely qualified by its facilities, technical personnel and breadth of experience to meet both military and commercial requirements for passive elements for the transmission, distribution and radiation of RF and microwave energy. Communication Products Company, a Phelps Dodge Electronics subsidiary in Marlboro, New Jersey, offers modern facilities and design capability in the production of rigid transmission line and small radiating antennas.

The standard product line consists of:

semiflexible, air dielectric coaxial cables, matching connectors and associated hardware
rigid transmission line, connectors and associated hardware
standard delay lines
standard Time Pulse Generators

From this product base, Phelps Dodge Electronics additionally offers:

custom cut lengths of coaxial cable, with or without terminations
to-specification coaxial cable assemblies
custom coaxial cable delay lines
special rigid line assemblies

Special services offered include:

development of special components
custom engineering of special coaxial cables
design and fabrication of hybrids, power splitters, and comparators
engineering of complete coaxial cable oriented sub-systems and systems

Table of Contents

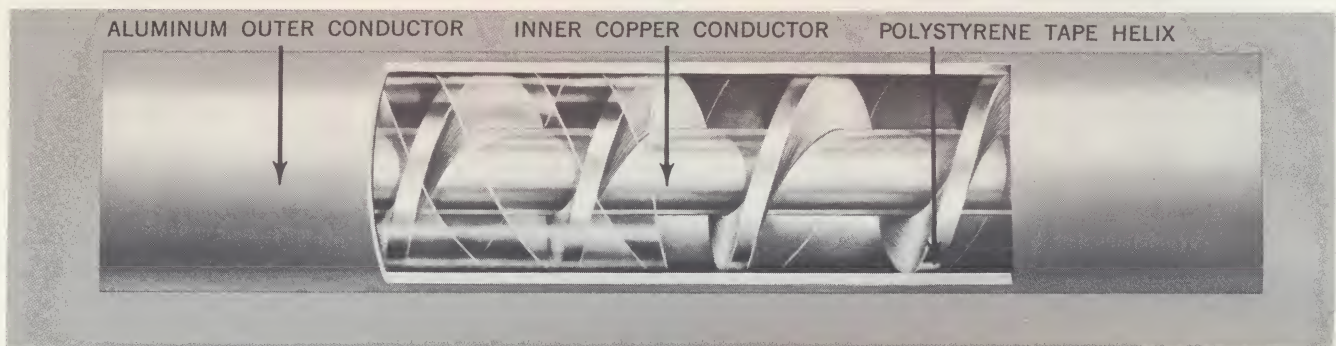
Introduction	I.F.C.
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Styroflex coaxial cable meets the demand for a reliable, high power, uniform, low-loss cable, ideally suited to AM, FM, VHF and UHF transmission. Other typical applications include: community antenna and microwave communications; radar, forward scatter, telemetering; delay lines, calibration standards and general pulse work; multi-channel, long-line telephone communications.

CABLE CONSTRUCTION: Styroflex cable is normally made in continuous 1,000' lengths, longer lengths are available in most sizes. In smaller diameter cables, the inner conductor is solid copper. In large diameters, the conductor is a copper tube. The inner conductor is supported coaxially in a continuous aluminum tube by a tape helix.

Styroflex tape is a unique form of polystyrene with excellent electrical and mechanical properties. The dielectric constant is 2.5; power factor 0.0002. Plasticizers are not required; flexibility is achieved by special manufacturing techniques. Elimination of the plasticizers also assures constancy of high tensile and compressive strengths of the Styroflex film (10,000-13,000 psi). Elongation at 10,000 psi is less than 3 percent. Styroflex tape will not cold flow. In underground installations, a polyethylene jacket is provided for corrosion protection. For additional mechanical protection, armoring may be applied over the polyethylene jacket for the most rugged conditions.

STYROFLEX® Coaxial Cable



Semi-flexible, Aluminum Sheathed

RETAINS ORIGINAL ELECTRICAL PROPERTIES FOR LIFE

Styroflex, an air dielectric cable, exhibits lower attenuation and higher velocity of propagation than solid dielectric coaxial cables. Temperature cycling affects attenuation by less than 1 percent per 5°C of change, resulting from changes in metal resistivities. Continuous support assures perfect centering of inner conductor during load cycling.

ELIMINATES UNNECESSARY FITTINGS... CUTS COSTS

Absence of fittings and connectors within the 1,000 foot lengths

of cable reduces upkeep, installation time and costs. Cable is pulled directly from the reel. Dehydration and pressurization needs are minimized.

ELIMINATES COSTLY EQUALIZING NETWORKS

Controlled pitch and tension of continuous helical insulation makes for greater longitudinal uniformity and low voltage standing wave ratio over the entire frequency range. Continuous aluminum outer conductor and pure polystyrene helix preclude deterioration.

electrical characteristics of STYROFLEX® coaxial cable, 50 ohm impedance

catalog number*	overall diameter (inches)	capacitance ($\mu\text{uF}/\text{ft.}$)	inductance high-frequency ($\mu\text{H}/\text{ft.}$)	velocity of propagation (percent)	dielectric constant	cutoff frequency 90% fco (kmc)	average power rating at 40°C ambient (kilowatts)			nominal attenuation (decibels per hundred feet)			60 cycle test voltage rms (kv)	maximum peak operating voltage (kv)	frequency of 1/2 wave-length periodicity (Kmc)
							10 mc	100 mc	1000 mc	10 mc	100 mc	1000 mc			
STA 38-50	3/8	24	0.059	85	1.35	14.3	4.3	1.3	0.40	0.34	1.15	3.9	2.2	0.96	9.56
STA 12-50	1/2	23	0.058	87	1.31	10.1	7.7	2.4	0.72	0.25	0.80	2.8	3.1	1.3	9.26
STA 78-50	7/8	22	0.056	90	1.23	5.7	18.0	5.6	1.6	0.14	0.44	1.6	5.5	2.4	5.67
STA 158-50	1 5/8	22	0.056	91	1.21	3.0	48.0	14.6	4.1	0.072	0.23	0.89	10.8	4.7	3.79
STA 318-50	3 1/8	22	0.055	92	1.17	1.5	125	37.0	9.5	0.037	0.12	0.52	19.0	8.7	2.42

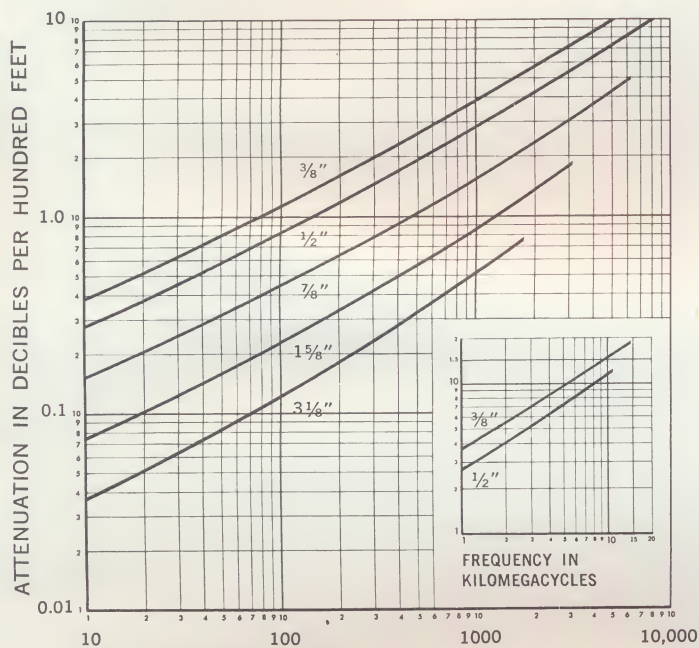
physical and mechanical characteristics of STYROFLEX® coaxial cable, 50 ohm impedance

catalog number*	RG #		inner conductor (inches)		outer conductor (inches)		jacket (inches)		minimum installed bending radius (inches)	maximum pulling tension (pounds)	approximate net weight per 1000 feet (pounds)	
	plain	jacketed	I.D.	O.D.	I.D.	O.D.	wall	O.D.			plain	jacketed
STA 38-50	—	—	Solid	0.112	0.296	0.375	0.030	0.435	4	210	97	112
STA 12-50	236/U	237/U	Solid	0.161	0.421	0.500	0.038	0.575	5	270	165	195
STA 78-50	197/U	232/U	Solid	0.300	0.758	0.875	0.053	0.980	10	770	500	570
STA 158-50	240/U	233/U	0.481	0.591	1.472	1.625	0.053	1.730	25	1850	930	1050
STA 318-50	242/U	234/U	1.015	1.157	2.850	3.125	0.075	3.275	50	6450	2700	3110

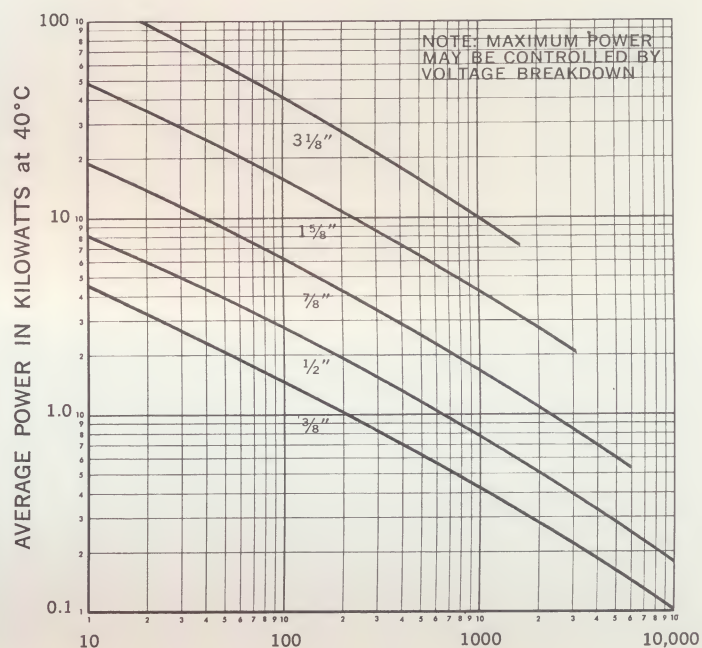
NOTE: Cable sizes and impedance other than shown may be obtained on request.

*Standard package reel is 1000 feet, $\pm 2\%$. All jacketed cables carry suffix "H".

Styroflex[®] Performance Curves



FREQUENCY IN MEGACYCLES



NOTE: MAXIMUM POWER MAY BE CONTROLLED BY VOLTAGE BREAKDOWN

CONNECTORS For Styroflex[®]

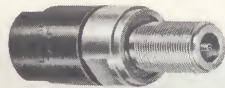
See pages 12-13 for identification data



N MALE 3/8", 1/2", 7/8"



UHF FEMALE 3/8", 1/2", 7/8"



N FEMALE 3/8", 1/2", 7/8"



TNC MALE 3/8", 1/2", 7/8"



HN MALE 3/8", 1/2", 7/8"



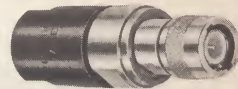
TNC FEMALE 3/8", 1/2", 7/8"



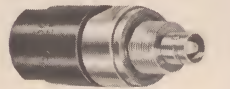
HN FEMALE 3/8", 1/2", 7/8"



BNC MALE 3/8", 1/2", 7/8"



C MALE 3/8", 1/2", 7/8"



BNC FEMALE 3/8", 1/2", 7/8"



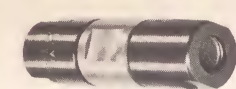
C FEMALE 3/8", 1/2", 7/8"



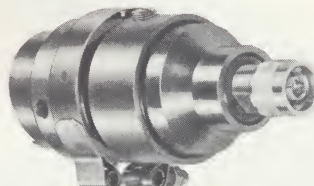
GR 3/8", 1/2", 7/8"



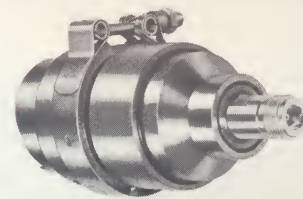
UHF MALE 3/8", 1/2", 7/8"



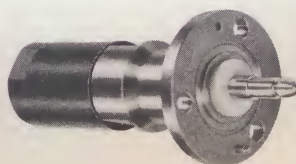
SPLICE 3/8", 1/2", 7/8"



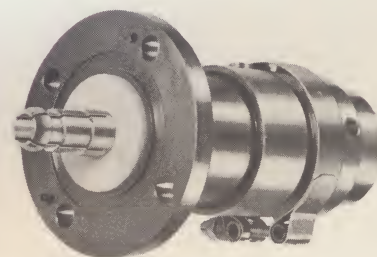
N MALE 1 5/8"



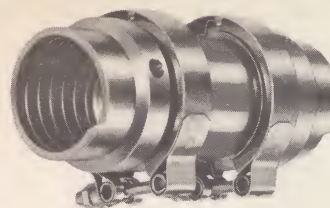
N FEMALE 1 5/8"



EIA 7/8"



EIA 1 5/8", 3 1/8"

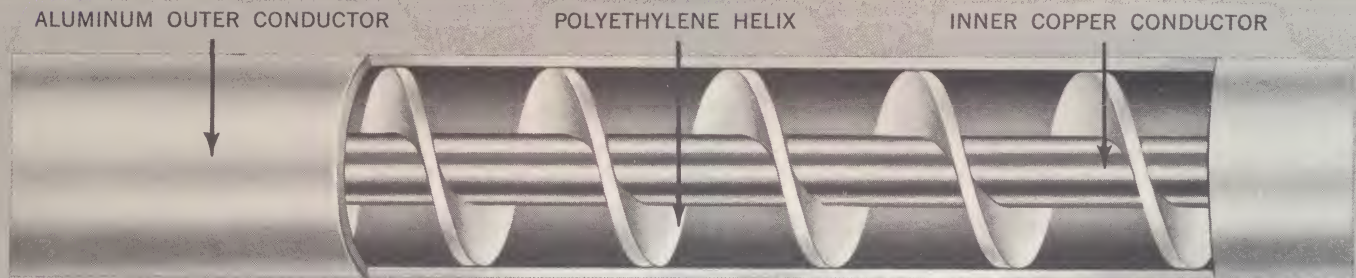


S 1 5/8", 3 1/8"

Female and GR Connectors shown for 3/8", 1/2" and 7/8" cable are immediately available in panel or bulkhead mount. Male connectors for same sizes are also immediately available for panel mount. Bulkhead mounted male connectors are available on special order.

Helical Membrane coaxial cable was developed to meet a demand in the communications field for a high power, low loss, uniform cable. The low attenuation, high velocity of propagation, power handling capability and excellent uniformity which are characteristic of the Helical Membrane cables have given the communications field one of the most versatile and economical coaxial cables available.

HELICAL MEMBRANE Coaxial Cable



Semi-flexible, Aluminum Sheathed

CONSTRUCTION Helical Membrane Cables are made in continuous lengths of 1000'. In smaller diameter cables, the inner conductor is a solid copper wire. In larger diameter cables, a copper tube is used. The inner conductor is supported coaxially in a commercially pure, continuous aluminum tube by a thin helix of polyethylene which is evenly spaced on to the inner conductor. A Teflon helix may be used where required by special high temperature applications.

MAIN ADVANTAGES

1. no radiation
2. simple and economic construction
3. uniform electrical properties over wide temperature and frequency variations
4. can be pressurized to improve voltage ratings
5. unlimited operating life

electrical characteristics of HELICAL MEMBRANE Cable 50 ohm impedance

catalog number*	overall diameter (inches)	capacitance ($\mu\mu\text{f}/\text{ft.}$)	inductance high-frequency ($\mu\text{H}/\text{ft.}$)	velocity of propagation (percent)	dielectric constant	cutoff frequency 90% fco (kmc.)	average power rating at 40°C (kilowatts)			nominal attenuation (decibels per hundred feet)			60 cycle test voltage rms (kv)	maximum operating voltage (kv)	frequency of 1/2 wave-length periodicity (Kmc)
							10 mc.	100 mc.	1000 mc.	10 mc.	100 mc.	1000 mc.			
HMA 12-50	1/2	21	0.053	96	1.09	10.8	5.8	1.6	0.56	0.24	0.76	2.47	1.9	1.3	14.4
HMA 78-50	7/8	21	0.053	96	1.09	6.0	14.0	4.4	1.32	0.13	0.43	1.42	3.4	2.4	8.2

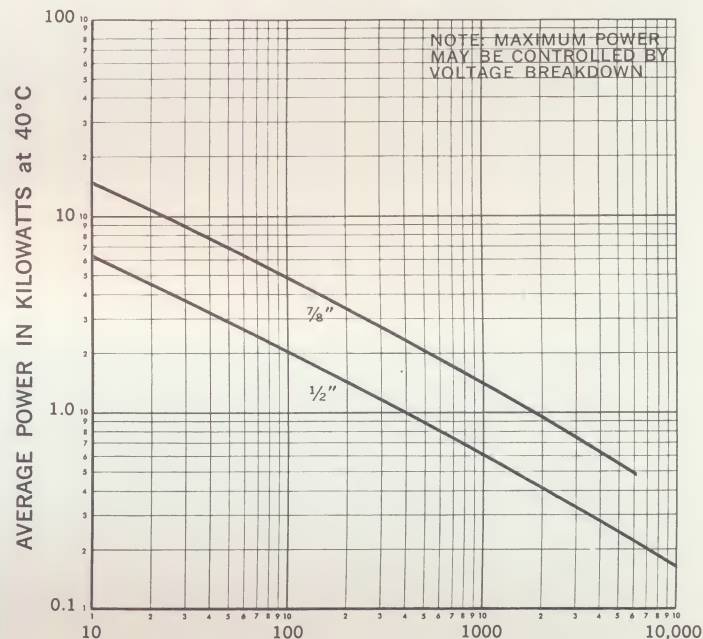
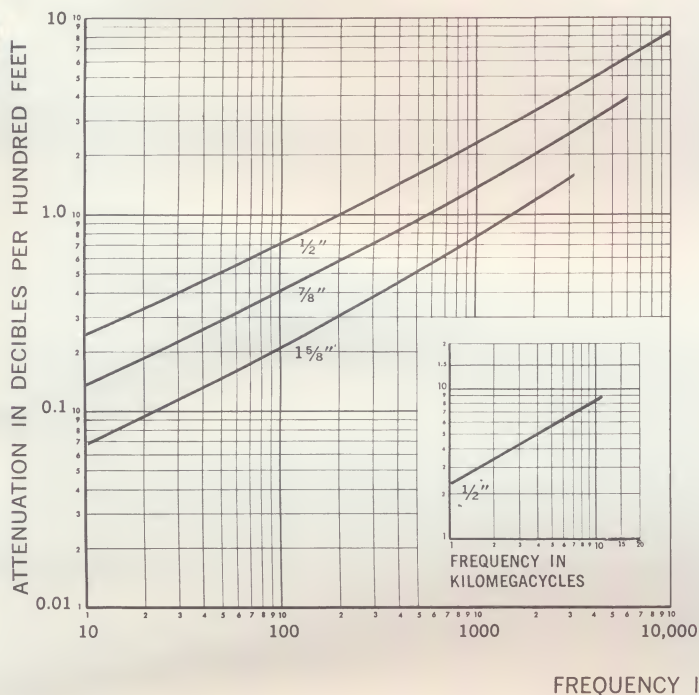
physical and mechanical characteristics of HELICAL MEMBRANE Cable 50 ohm impedance

catalog number*	overall size (inches)	inner conductor		outer conductor (inches)		jacket (inches)		minimum installed bending radius (inches)	maximum pulling tension (pounds)	approximate net weight per 1000 feet (pounds)	
		I.D.	O.D.	I.D.	O.D.	wall	nominal O.D.			plain	jacketed
HMA 12-50	1/2	Solid	0.176	0.421	0.500	0.038	0.575	6	270	185	215
HMA 78-50	7/8	0.248	0.318	0.758	0.875	0.053	0.980	11	770	340	410

NOTE: Cable sizes and impedance other than shown may be obtained on request.

*Standard package reel is 1000 feet, $\pm 2\%$. All jacketed cables carry suffix "H".

Helical Membrane Performance Curves



CONNECTORS For Helical Membrane

See pages 12-13 for identification data



N MALE 1/2", 7/8"



C FEMALE 1/2", 7/8"



BNC MALE 1/2", 7/8"



N FEMALE 1/2", 7/8"



UHF MALE 1/2", 7/8"



BNC FEMALE 1/2", 7/8"



HN MALE 1/2", 7/8"



UHF FEMALE 1/2", 7/8"



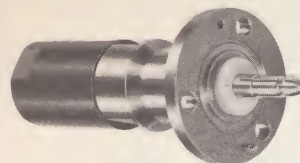
GR 1/2", 7/8"



HN FEMALE 1/2", 7/8"



TNC MALE 1/2", 7/8"



EIA 7/8"



C MALE 1/2", 7/8"



TNC FEMALE 1/2", 7/8"



SPLICE 1/2", 7/8"

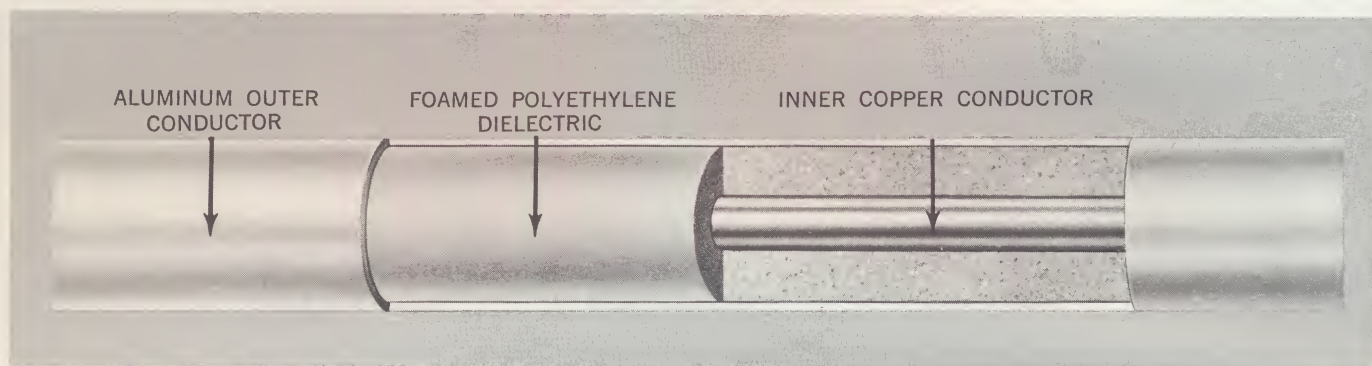
Female and GR Connectors shown for 3/8", 1/2" and 7/8" cable are immediately available in panel or bulkhead mount. Male connectors for same sizes are also immediately available for panel mount. Bulkhead mounted male connectors are available on special order.

Particularly in aircraft and spacecraft, where requirements demand products combining high performance with reliability and light weight, Foamflex coaxial cable becomes a logical choice. Providing greater efficiency than conventional braided cable, lower-loss Foamflex construction makes it possible to specify smaller size cable than needed with braided cable and still achieve equivalent loss figures, an important weight-saving factor. The foamed polyethylene insulation offers a practical form of homogeneous, air-filled dielectric which retains its normal dielectric strength even at high altitudes without pressuriza-

tion. The reduction of dielectric constant, compared to solid polyethylene, results in a lower attenuation characteristic.

In addition to the many special applications of the aviation industry, Foamflex coaxial cable has proved to be a superior low-loss cable for many military uses in telemetry, missile guidance, microwave, delay lines and GSE systems as well as in more general areas including community antenna, broadcast, communications and closed-circuit television.

FOAMFLEX *Semi-flexible, Aluminum Sheathed*



Air Dielectric Coaxial Cable

The illustration shows cable construction, consisting of a copper inner conductor, a foamed polyethylene dielectric and thin wall outer aluminum conductor. A Habirlene jacket can be supplied for added protection.

Semi-flexible Foamflex offers a series of outstanding advantages which cannot be met by similar products including solid dielectric (RG) types of cable:

- no radiation
- low attenuation
- good frequency response
- high phase stability
- uniform electrical properties over wide temperature variations
- unlimited operating life
- low cost
- light weight

electrical characteristics of FOAMFLEX Cable 50 ohm impedance

catalog number*	overall diameter (inches)	capacitance ($\mu\text{mf}/\text{ft.}$)	inductance high-frequency ($\mu\text{h}/\text{ft.}$)	velocity of propagation (percent)	dielectric constant	cutoff frequency 90% fco (kmc.)	average power rating at 40°C ambient (kilowatts)			nominal attenuation (decibels per hundred feet)			60 cycle test voltage rms (kv)	maximum peak operating voltage (kv)
							10 mc	100 mc	1000 mc	10 mc	100 mc	1000 mc		
FXA 14-50	1/4	25	0.061	81	1.50	19.2	4.8	1.50	0.42	0.53	1.74	6.10	1.6	1.1
FXA 38-50	3/8	25	0.061	81	1.50	12.5	8.5	2.6	0.71	0.35	1.16	4.26	2.5	1.7
‡FXA 12-50	1/2	25	0.061	81	1.50	9.0	12.6	3.8	1.00	0.25	0.86	3.31	3.5	2.5
FXA 78-50	7/8	25	0.061	81	1.50	5.0	25.7	7.3	1.78	0.15	0.52	2.23	6.2	4.3
FXA 158-50	1-5/8	25	0.061	81	1.50	2.7	51.4	14.0	2.90	0.08	0.32	1.60	11.0	8.0

physical and mechanical characteristics of FOAMFLEX Cable 50 ohm impedance

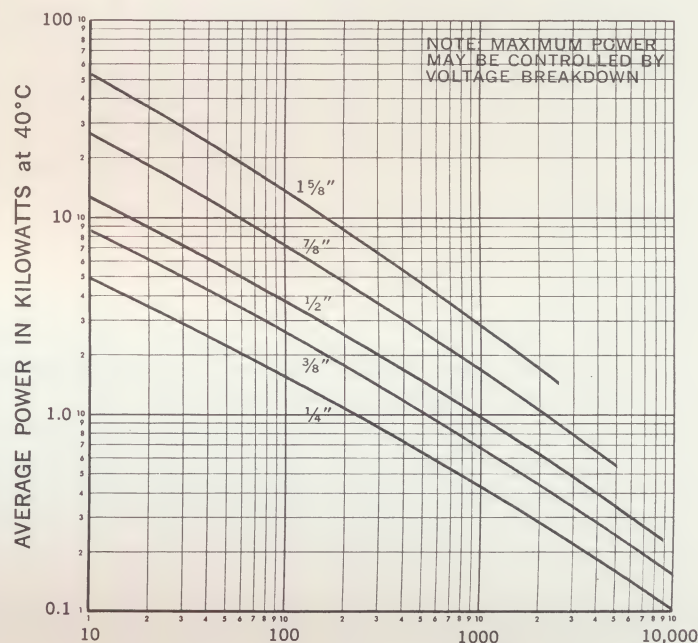
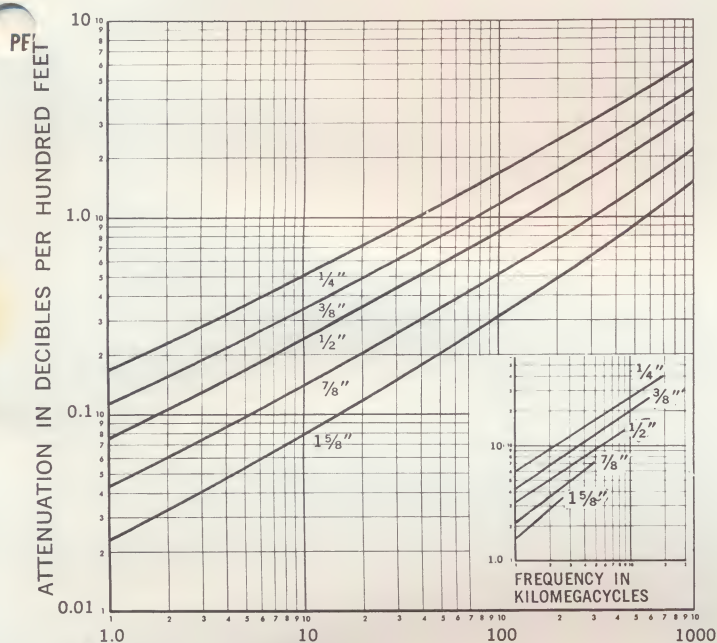
catalog number*	RG#		inner conductor (inches)		outer conductor (inches)		jacket (inches)		minimum installed bending radius (inches)	maximum pulling tension (inches)	approximate net weight per 1000 feet (pounds)	
	plain	jacketed	I.D.	O.D.	I.D.	O.D.	nominal					
							wall	O.D.				
FXA 14-50	—	—	Solid	0.076	0.210	0.250	0.020	0.290	2.5	70	41	49
FXA 38-50	—	—	Solid	0.117	0.325	0.375	0.030	0.435	4	140	89	104
‡FXA 12-50	—	331/U	‡Solid	0.162	0.450	0.500	0.038	0.575	5	190	152	182
FXA 78-50	332/U	333/U	Solid	0.288	0.801	0.875	0.053	0.980	10	480	458	528
FXA 158-50	—	—		0.420	1.472	1.625	0.053	1.730	25	1850	1065	1185

NOTE: Cable sizes and impedance other than shown may be obtained on request.

*Standard package reel is 1000 feet, $\pm 2\%$. All jacketed cables carry suffix "H".

‡ AFX 12-50 = RG-231/U, use same data except tubular inner conductor.

Foamflex Performance Curve



NOTE: MAXIMUM POWER MAY BE CONTROLLED BY VOLTAGE BREAKDOWN

CONNECTORS For Foamflex

See pages 12-13 for identification data



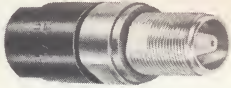
N MALE
1/4", 3/8", 1/2", 7/8"



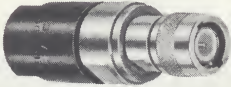
N FEMALE
1/4", 3/8", 1/2", 7/8"



HN MALE
1/4", 3/8", 1/2", 7/8"



HN FEMALE
1/4", 3/8", 1/2", 7/8"



C MALE
1/4", 3/8", 1/2", 7/8"



C FEMALE
1/4", 3/8", 1/2", 7/8"



UHF MALE
1/4", 3/8", 1/2", 7/8"



UHF FEMALE
1/4", 3/8", 1/2", 7/8"



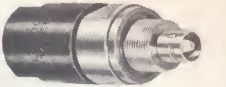
TNC MALE
1/4", 3/8", 1/2", 7/8"



TNC FEMALE
1/4", 3/8", 1/2", 7/8"



BNC MALE
1/4", 3/8", 1/2", 7/8"



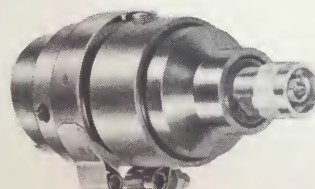
BNC FEMALE
1/4", 3/8", 1/2", 7/8"



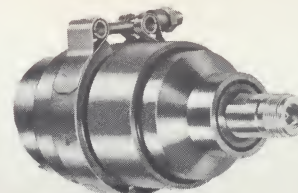
GR
1/4", 3/8", 1/2", 7/8"



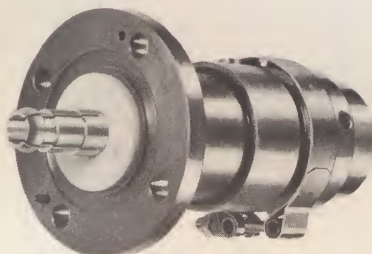
SPLICE
1/4", 3/8", 1/2", 7/8"



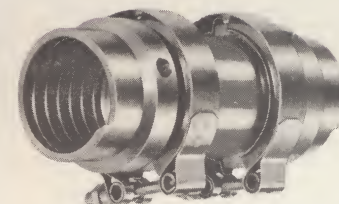
N MALE
1 5/8"



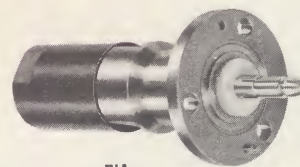
N FEMALE
1 5/8"



S
1 5/8"



EIA
1 5/8"



EIA
7/8"

Female and GR Connectors shown for 3/8", 1/2" and 7/8" cable are immediately available in panel or bulkhead mount. Male connectors for same sizes are also immediately available for panel mount. Bulkhead mounted male connectors are available on special order.

MINIATURE Coaxial Cable

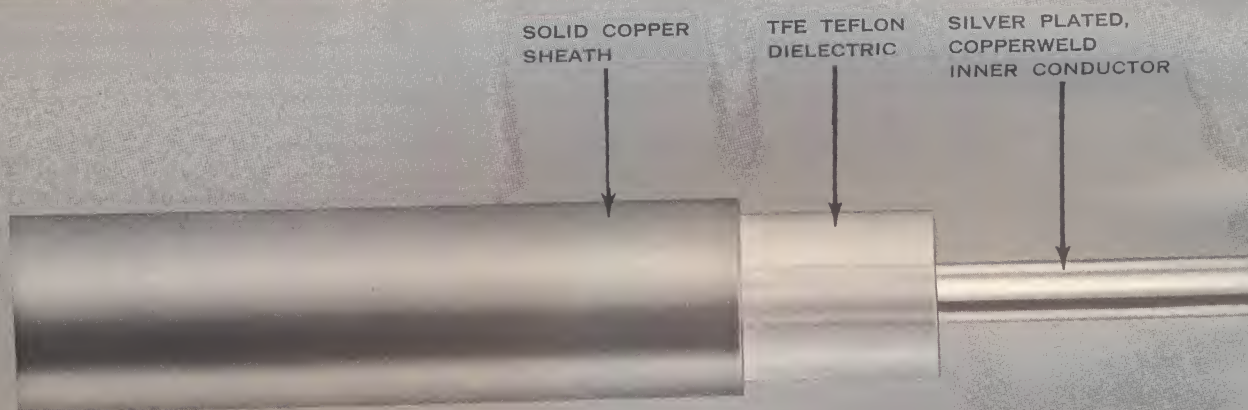
Now, new from Phelps Dodge Electronics, miniature coaxial cable providing extreme flexibility and greatly extended parameters in a variety of applications including low noise amplifiers, microwave transmission, high speed computers as well as black boxes.

Offered in three sizes off-the-shelf, .141", .070" and .085" and in random lengths from 12' to 100', construction consists of a silver plated, Copperweld inner conductor with a TFE Teflon dielectric and solid copper sheath. Impedance is 50 ohm \pm .5 ohms.

Phelps Dodge Electronics miniature coaxial cable exhibits highly favorable electrical characteristics, soft copper sheath, crack-free even under extreme bending and other important mechanical advantages.

OUTSTANDING ADVANTAGES

- Excellent VSWR due to tight impedance specification
- Very low attenuation across Gc Band
- Extreme flexibility, withstands repeated flexing
- No radiation
- Maintains characteristic impedance of 50 ohms despite extreme bends
- No performance deterioration at environmental extremes
- Ease of stripping, tinning or soldering, convenient installation



electrical characteristics of MINIATURE Coaxial Cable

table I

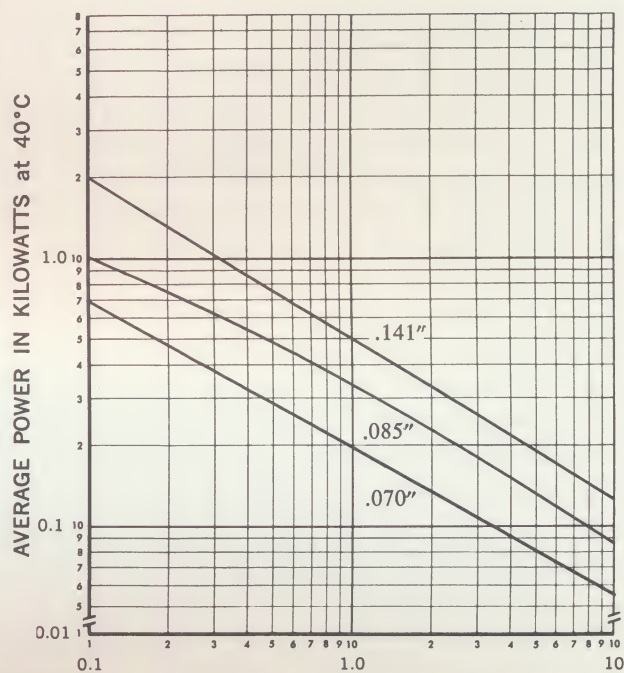
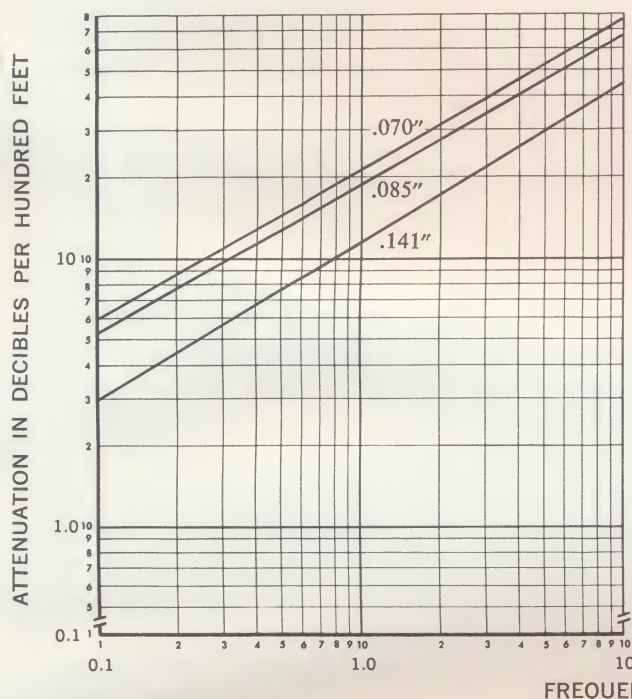
CHARACTERISTIC IMPEDANCE (ohms)	CATALOG NUMBER	NOMINAL OVERALL DIAMETER (inches)	CAPACITANCE (μ f/ft.)	VELOCITY OF PROPAGATION (Percent)	DIELECTRIC CONSTANT	ATTENUATION (decibels per hundred feet)			MAXIMUM PEAK OPERATING VOLTAGE (V)
						100 Mc	1000 Mc	10,000 Mc	
50	CT-070-50	.070	30	70	2.1	6	20.2	74	1000
50	CT-085-50	.085	30	70	2.1	5.7	18.5	64	1500
50	CT-141-50	.141	30	70	2.1	3	11.5	45	1900

physical and mechanical characteristics

table II

CHARACTERISTIC IMPEDANCE (ohms)	CATALOG NUMBER	INNER CONDUCTOR O.D. NOMINAL	OUTER CONDUCTOR		MINIMUM INSTALLED BENDING RADIUS (inches)
			I.D. NOMINAL	O.D. NOMINAL	
50	CT-070-50	.020	.060	.070	1/8
50	CT-085-50	.020	.066	.085	1/8
50	CT-141-50	.036	.119	.141	1/4

Miniature Coaxial Cable performance curves



CONNECTORS For Miniature Cable See pages 12-13 for identification data

<p>OSM 201-1 Plug/Cable .141-in. semi-rigid cable</p>		<p>OSM 251-2 Plug/.085-in. semi-rigid cable</p> <p>OSM 251-3 Plug/.070-in. semi-rigid cable</p>	<p>OSSM 251-2 shown</p>
<p>OSM 202-1 Jack/Cable .141-in. semi-rigid cable</p>		<p>OSM 252-2 Jack/.085-in. semi-rigid cable</p> <p>OSM 252-3 Jack/.070-in. semi-rigid cable</p>	<p>OSSM 252-2 shown</p>
<p>OSM 206-1 Flange Mount, Jack/Cable .141-in. semi-rigid cable</p>		<p>OSM 260-2 Flange Mount Jack/.085-in. semi-rigid cable</p> <p>OSM 260-3 Flange Mount Jack/.070-in. semi-rigid cable</p>	<p>OSSM 260-2 shown</p>
<p>OSM 221-1 Right Angle, Plug/Cable .141-in. semi-rigid cable</p>		<p>OSM 271-2 Right Angle Plug/.085-in. semi-rigid cable</p> <p>OSM 271-3 Right Angle Plug/.070-in. semi-rigid cable</p>	<p>OSSM 271-2 shown</p>

Shown here are representative samples of connectors for Phelps Dodge Electronics Miniature Cable. These connectors, manufactured by Omni Spectra Inc., are available through Omni Spectra, Inc. OSM* connectors were developed to meet the requirements for miniature, highly reliable low VSWR connectors useable throughout the microwave fre-

quency range on .141", .070" and .085" semi-rigid cable. Typical VSWR is 1.05 or less through 12.4 Gc and operational capability up to frequencies of 26 Gc.

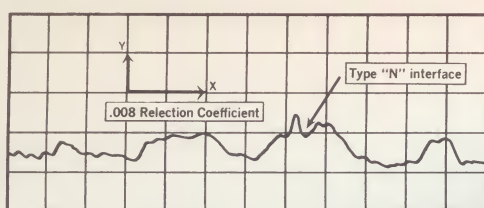
Details on other connectors and/or adapters to other coaxial interfaces are available from Phelps Dodge Electronic Products Corporation or Omni Spectra, Inc.

*OSM is a registered trademark of Omni Spectra, Inc.

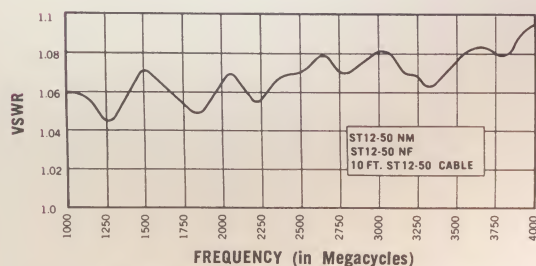
General Connector Information

Connectors for Phelps Dodge Electronics cables use the same general terminology as the more familiar UG type connectors for braided coaxial cables. The main exceptions are the use of "male" instead of "plug", and "female", instead of "jack".

Connectors for Styroflex and Helical Membrane coaxial cables are sealed and guaranteed to maintain pressures up to 30 PSI when properly installed. Gas ports, 1/8" NPT threaded, are provided in all connectors for attachment of pressurizing lines, gages, etc. EIA connectors have a gas passage hole through the dielectric bead. EIA connectors can be furnished with gas barriers on special order. Connectors are shipped with pipe plugs screwed into gas ports. Pressure gages, tees and pipe plugs for use on pressurized installations are available.



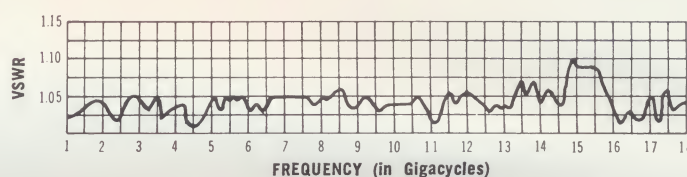
TDR trace of mated Type "N" male (ST 12-50NM) and Type "N" Female (ST 12-50NF) adaptors on section of 1/2 50 ohm Styroflex® cable.



TYPICAL PERFORMANCE OF MATED STYROFLEX CONNECTORS

All PDE connector terminations of types covered by Military Standards will mate with any opposite sex Military Standards connector of the same type. EIA connectors mate with rigid line and flanges conforming to Electronic Industry Association standards.

The PDE connector is designed to assure high performance of the installed cable assembly. Electrical reflections which give rise to serious VSWR problems in most other connectors have been minimized in the PDE design through the careful use of matching and reactance compensating techniques. Design features include an uninterrupted wave surface path through the connector. Outer conductor joints are pressure butt type with electrical contact made on the inside diameter of the butt. Center conductor contact is obtained through the use of high pressure spring fingers,



TYPICAL PERFORMANCE OF MATED OSM CONNECTORS

assuring a ring or band contact around the center conductor of the cable. Resonant effects due to electrical contact within the center conductor as in the "basket" or "indented" designs are eliminated.

Voltage breakdown ratings of PDE connectors generally are equal to or greater than the mating termination. For example, in the case of an N male connector for 1/2" 50 ohm Styroflex coaxial cable (ST 12-50NM), the connector has a breakdown rating at least equal to the UG series N connector. This is less than the breakdown rating of 1/2" 50 ohm Styroflex cable.

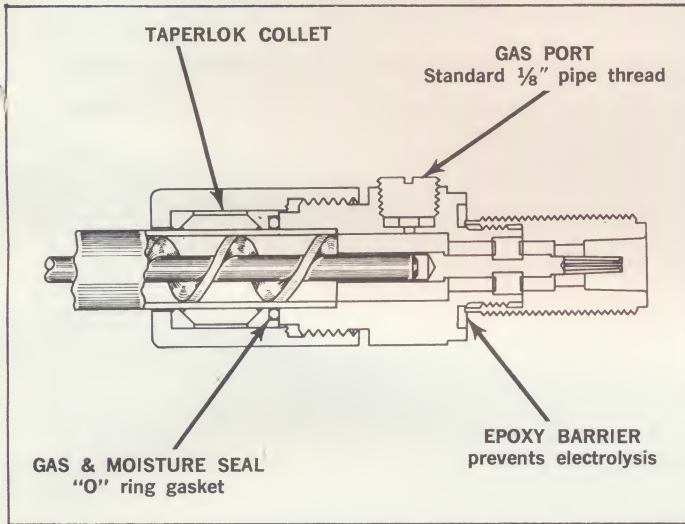
CONNECTOR CHART FOR IDENTIFICATION

FX	12	50	N	F	P
CABLE TYPE	CABLE SIZE	IMPEDANCE IN OHMS	ADAPTER TYPE	SEX	MOUNTING
FX-Foamflex	18 = .180"*	50	N	M-Male	P-Panel
ST-Styroflex	14 = 1/4"	75*	HN	F-Female	B-Bulkhead
HM-Helical Membrane	38 = 3/8"	100*	TNC		
	12 = 1/2"	125*	BNC		
	34 = 3/4"*		C		
	78 = 7/8"		UHF		
	158 = 1 5/8"		GR		
	318 = 3 1/8"		EIA		
			S		

First code represents cable type, second diameter, third impedance, fourth adapter type, fifth sex, sixth code is for mounting desired. FX 12 50 NF P, for example, signifies Foamflex, 1/2" 50 ohm cable with a type N female connector designed for panel mounting.

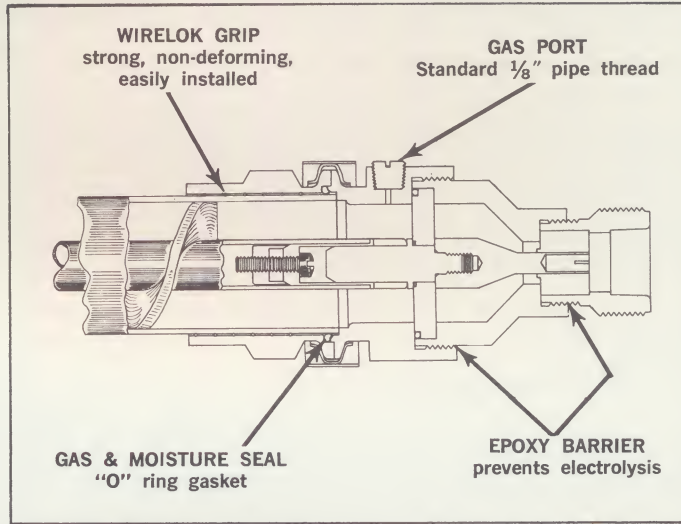
*on special order only.

TAPERLOK CONNECTOR DESIGN FEATURES



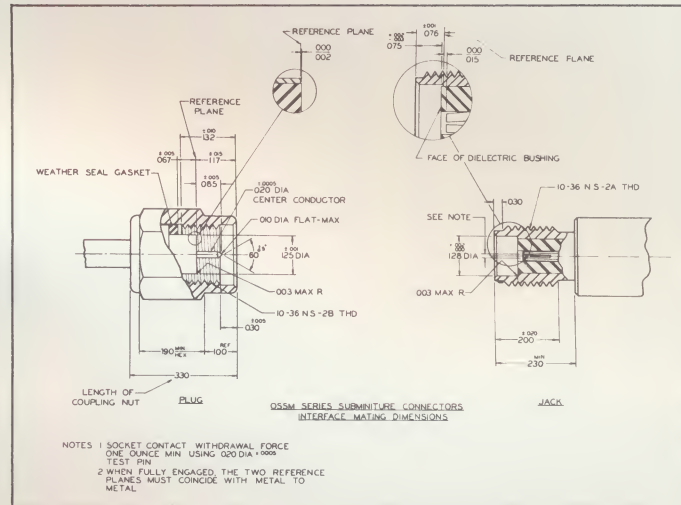
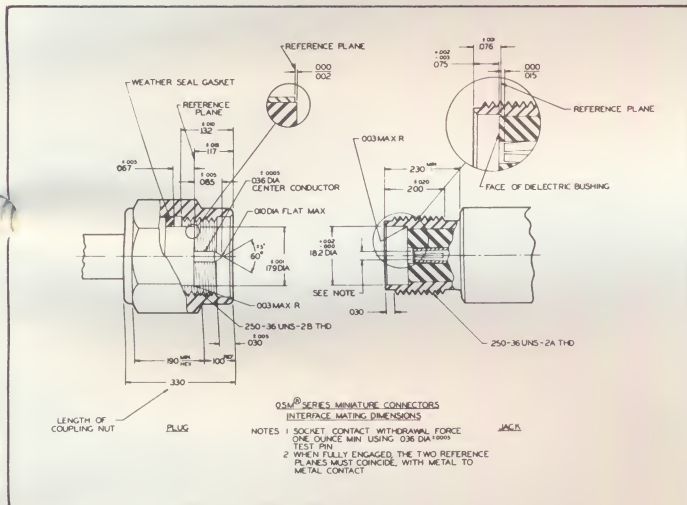
Phelps Dodge Electronics connectors for coaxial cables in 1/4", 3/8", 1/2" and 7/8" diameters utilize the Taperlok method of attachment. A captivated collet holding mechanism with a baked on dry lubricant utilizes a 45° chamfer for a positive grip. The cable sheath is forced into the connector body to assure good RF contact, low VSWR. Simple attachment without special tools, quick release, color coding by size, epoxy barrier to prevent electrolysis and a dry lubricated thread are outstanding features.

WIRELOK® CONNECTOR DESIGN FEATURES



Connectors for Pheips Dodge Electronics coaxial cables in 1½" and 3¼" diameter utilize the Wirelok method of attachment. A barbed, helically coiled wire is placed over the cable. A helically grooved sleeve is screwed over the wire, embedding it in the cable's outer conductor and providing a rigid base for connector mounting. This patented system combines ease of mounting with excellent strength.

MINIATURE CONNECTOR DESIGN FEATURES



Phelps Dodge Electronics Miniature Coaxial Cables are available with miniature connectors factory installed. These cable assemblies can be fabricated to a great many configurations to meet all standard electrical parameters. OSM* connectors are designed for .141-inch cable; OSSM connectors match .085-inch cable. The above drawings show the difference in the interface dimensions in the two connector types. OSSM connectors for .070-inch coaxial cable are also available.

*OSM is a registered trademark of Omni Spectra, Inc.

*OSM is a registered trademark of Omni Spectra, Inc.

CONNECTOR DIMENSION CHART

Cable Size												
	O.D. $\frac{1}{4}$ LENGTH		O.D. $\frac{3}{8}$ LENGTH		O.D. $\frac{1}{2}$ LENGTH		O.D. $\frac{7}{8}$ LENGTH		O.D. $1\frac{1}{8}$ LENGTH		O.D. $1\frac{3}{8}$ LENGTH	
N MALE	$1\frac{3}{16}$	$2\frac{3}{8}$	$1\frac{5}{16}$	3	1	$3\frac{1}{8}$	$1\frac{3}{8}$	$4\frac{1}{8}$	$3\frac{3}{16}$	$5\frac{5}{16}$	—	—
N FEMALE	$\frac{3}{4}$	$2\frac{3}{8}$	$1\frac{5}{16}$	3	1	$3\frac{1}{8}$	$1\frac{3}{8}$	$4\frac{1}{8}$	$3\frac{3}{16}$	$5\frac{5}{8}$	—	—
HN MALE	$1\frac{5}{16}$	$2\frac{1}{2}$	$1\frac{5}{16}$	$3\frac{1}{8}$	1	$3\frac{1}{4}$	$1\frac{3}{8}$	$4\frac{1}{4}$	—	—	—	—
HN FEMALE	$\frac{3}{4}$	$2\frac{5}{16}$	$1\frac{5}{16}$	$2\frac{15}{16}$	1	$3\frac{1}{8}$	$1\frac{3}{8}$	$4\frac{1}{16}$	—	—	—	—
UHF MALE	$\frac{3}{4}$	$2\frac{5}{16}$	$1\frac{5}{16}$	$2\frac{15}{16}$	1	$3\frac{1}{8}$	$1\frac{3}{8}$	$4\frac{1}{16}$	—	—	—	—
UHF FEMALE	$\frac{3}{4}$	$2\frac{3}{8}$	$1\frac{5}{16}$	3	1	$3\frac{1}{8}$	$1\frac{3}{8}$	$4\frac{1}{8}$	—	—	—	—
C MALE	$\frac{3}{4}$	$2\frac{3}{8}$	$1\frac{5}{16}$	3	1	$3\frac{1}{8}$	$1\frac{3}{8}$	$4\frac{1}{8}$	—	—	—	—
C FEMALE	$\frac{3}{4}$	$2\frac{1}{4}$	$1\frac{5}{16}$	$2\frac{7}{8}$	1	3	$1\frac{3}{8}$	4	—	—	—	—
BNC MALE	$\frac{3}{4}$	$2\frac{7}{16}$	$1\frac{5}{16}$	$3\frac{1}{16}$	1	$3\frac{3}{16}$	$1\frac{3}{8}$	$4\frac{3}{16}$	—	—	—	—
BNC FEMALE	$\frac{3}{4}$	$2\frac{1}{8}$	$1\frac{5}{16}$	$2\frac{3}{4}$	1	$2\frac{7}{8}$	$1\frac{3}{8}$	$3\frac{7}{8}$	—	—	—	—
TNC MALE	$\frac{3}{4}$	$2\frac{7}{16}$	$1\frac{5}{16}$	$3\frac{1}{16}$	1	$3\frac{3}{16}$	$1\frac{3}{8}$	$4\frac{3}{16}$	—	—	—	—
TNC FEMALE	$\frac{3}{4}$	$2\frac{1}{8}$	$1\frac{5}{16}$	$2\frac{3}{4}$	1	$2\frac{7}{8}$	$1\frac{3}{8}$	$3\frac{7}{8}$	—	—	—	—
GR (SEXLESS)	$\frac{7}{8}$	$3\frac{1}{16}$	$1\frac{5}{16}$	$3\frac{11}{16}$	1	$3\frac{13}{16}$	$1\frac{3}{8}$	$4\frac{13}{16}$	—	—	—	—
SPLICE	$\frac{5}{8}$	$2\frac{3}{16}$	$1\frac{5}{16}$	$3\frac{5}{8}$	1	$3\frac{15}{16}$	$1\frac{3}{8}$	$5\frac{3}{4}$	$3\frac{3}{16}$	$5\frac{7}{16}$	$5\frac{5}{8}$	$6\frac{7}{8}$
EIA	—	—	—	—	—	—	$2\frac{1}{4}$	—	$3\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{5}{8}$	$6\frac{5}{8}$

Coaxial Cable Accessories

A complete line of off-the-shelf supporting hardware, complementing accessories and installation tools are specifically designed to be used in conjunction with Phelps Dodge Electronics air dielectric, semi-flexible coaxial cable and PDE Rigid Line. By utilizing an extensive background of experience in the manufacture of coaxial cable and accessories plus the subsystem design and installation of

RF and microwave feed networks, Phelps Dodge Electronics can offer assurance of field-proven products.

Engineering aid is available to help in systems planning and the fabrication of specialty hardware for customer requirements. Additionally, custom designed hardware can be created to fill highly specialized applications. Contact our engineering department for prompt quotation.

CABLE GRIPS



For raising plain or Habirlene jacketed cables and supporting them at the top of vertical runs.

Cat. No.	CG-38	CG-12	CG-78	CG-158	CG-318
Line Size	3/8	1/2	7/8	1 1/8	3 1/8

Same Cat. Nos. for plain or Habirlene jacketed

GUIDE RING HANGERS



Directly attached for use in securing larger diameter cables to supporting tower.

Cat. No. GRH-158 for 1 1/8" line

Cat. No. GRH-318 for 3 1/8" line

Add suffix "H" to Cat. No. for Habirlene jacketed line use

CLAMP



Single hole stamped aluminum.

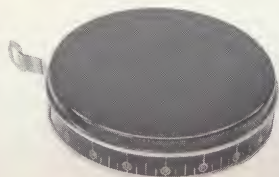
Cat. No.	CC-38	CC-12	CC-78	CC-158	CC-318
Line Size	3/8	1/2	7/8	1 1/8	3 1/8

STRAPTITE

Stainless Steel for use in securing cables to all types of supporting structures. Supplied in 100 foot coils complete with wrench and fastening buckles.

Cat. No. SPT for 3/8", 1/2", 7/8"

Same Cat. Nos. for plain or Habirlene jacketed



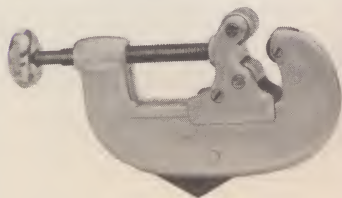
SPLICE PROTECTION KIT

Cat. No. F-2870

For protection of splices and fittings that are directly buried or subjected to corrosive atmospheres. Kit contains all tapes and compounds required to protect as follows:

Cable Size	Covering No. of Kits	No. of Joints Covered
3/8-1/2	1	4
7/8	1	2
1 1/8	1	1
3 1/8	2	1

TUBING CUTTERS



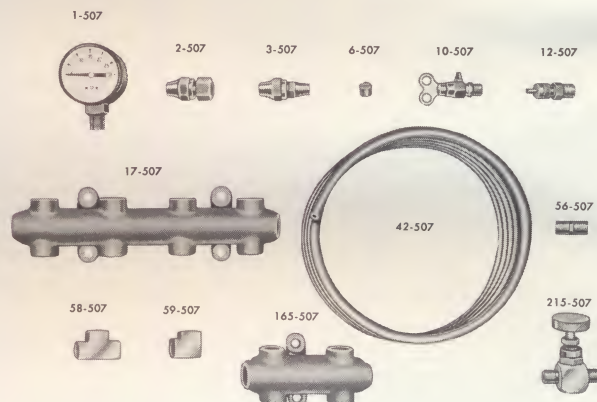
Catalog No.	Cable Size
TC-1	3/16" to 1 1/8"
TC-2	2" to 4 1/4"
TC-3	5/8" to 2 1/8"

AUTO DRYAIRE DEHYDRATOR Cat. No. 103-507

The fully Automatic Auto-Dryaire Dehydrator (1cfm Dual Drying Chamber) — makes use of a new, diaphragm type, 1 cfm Super-Life Compressor. This compressor, produced specifically for dehydrator service, is capable of continuous operation for many thousands of hours. The Auto-Dryaire Dehydrator is designed around the Super-Life Compressor, two identical drying chambers, a timer and a system of four solenoid valves.

The atmospheric air is filtered, compressed and supplied to the input fittings of the two drying chambers. The solenoid valves, two in each drying chamber output line, are so sequenced that during the first seven hours of compressor operation, dry air is supplied by one drying chamber to the DRY AIR output fitting. At the same time, the second drying chamber is being reactivated by its internal tubular heater. The moisture-laden air is routed by the valve system to the DRAIN fitting. At the end of this seven-hour period, the drying chamber which has been reactivated is allowed to cool. The chamber which has been supplying dry air continues to do so for an additional five hours. The air pressure at the DRY AIR output fitting is controlled between 10 and 15 psi by an internal pressure switch.

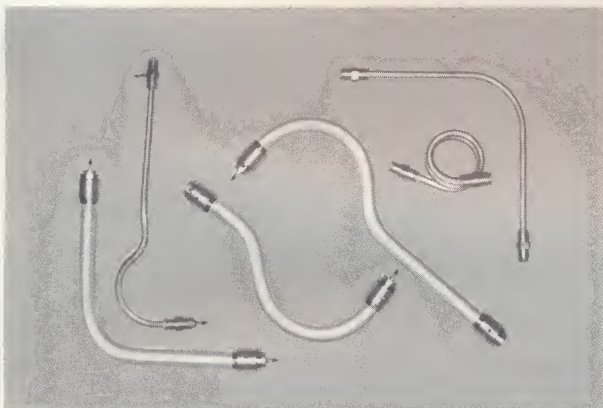
Then the chamber which has been supplying dry air for a total of twelve hours is reactivated, the fresh chamber being used to dry the air supplied by the compressor.



INTERCONNECTING ACCESSORIES

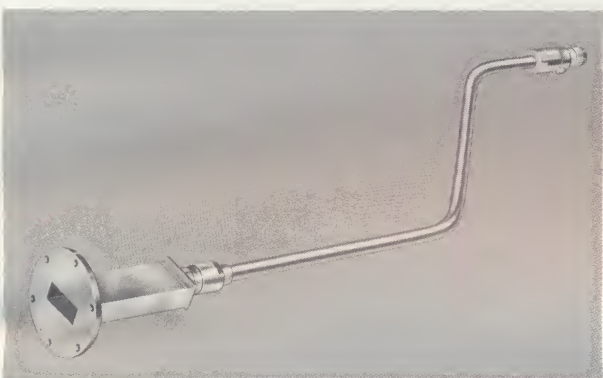
- 1-507 Pressure gauge (0-30 psi) 1 1/2" dia. with 1/8" male pipe thread bottom connection.
- 2-507 Connector, 1/8" female pipe thread x 1/4" flare, with flare nut.
- 3-507 Connector, 1/8" male pipe thread x 1/4" flare, with flare nut.
- 6-507 Pipe plug, 1/8" male pipe thread. (male).
- 10-507 Bleeder valve with separable key, 1/8" male pipe thread.
- 12-507 Line inlet valve, Schrader (male) x 1/8" male pipe thread.
- 17-507 Manifold, 1/8" female pipe thread (4 on each side and 1 at each end.)
- 42-507 Soft drawn copper tube, 1/4" o.d. (specify length).
- 56-507 Pipe nipple, 1/8" male pipe thread x 3/4" long.
- 58-507 Pipe tee, 1/8" x 1/8" x 1/8" (all female pipe threads).
- 59-507 Pipe elbow, 1/8" x 1/8" (both female pipe threads).
- 165-507 Manifold, 1/8" female pipe thread (2 on each side and 1 at each end.)
- 215-507 Needle valve, 1/8" male pipe thread x 1/8" male pipe thread.

Coaxial Cable Assemblies

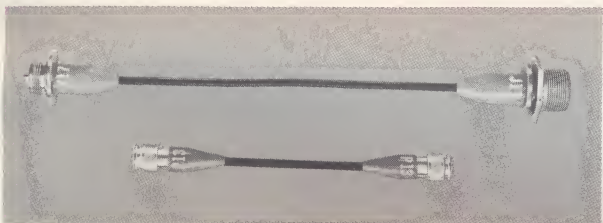


Phelps Dodge Electronic's coaxial cables are available by the mile or by the foot. They are also available in unique, one-of-a-kind shapes and configurations which greatly extend application parameters. For instance, in transmitter installations, a cable assembly can eliminate the need for elbows and other high cost RF plumbing. In tight physical confines, or under difficult environmental conditions, a special cable assembly might well be the answer to the problem.

Hundreds have been designed and produced. And, they are all different. A need for tracking antenna harnesses, as an example, resulted in sections of cable which accurately place each antenna element in phase with other elements. Special local oscillator and receiver lines, each a section of copper Styroflex® coaxial cable, have been cut to extremely tight electrical length for transition to waveguide. An airborne vibration isolator was designed, as a highly flexible corrugated assembly connecting rigid line to shock mounted gear. Cable assemblies have also been used in equalizing and balancing networks and matching sections.

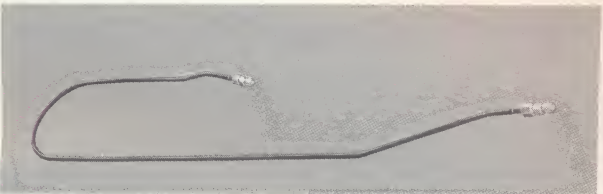


This end-fired waveguide to coaxial cable transition is an excellent example of making cable an integral part of an assembly. The coaxial cable is cut to within 2° of a standard at C band frequencies. VSWR of 1.25 maximum is exhibited.

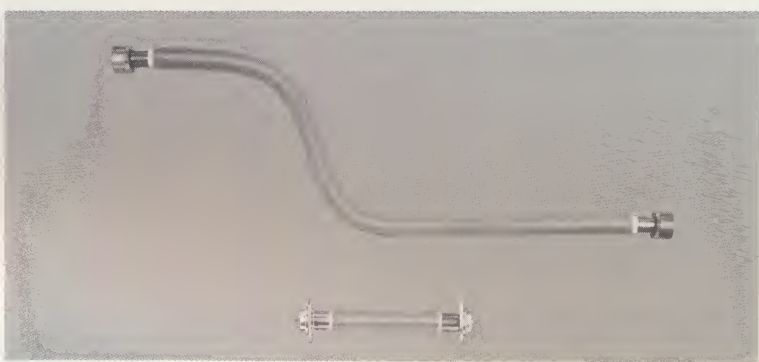


Small diameter, flexible, braided cable with solid irradiated polyethylene dielectric in a silver plated copper braid with outer jacket of irradiated polyethylene is used for both of these harnesses. Molded rubber boots with identification in relief cover the cable entry point into the connectors.

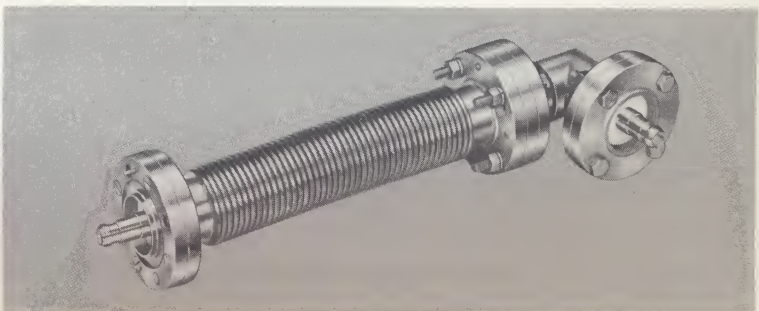
TNC connectors with a high temperature dielectric provide termination on the assembly coded P-13. J-17 assembly has a removable adapter which provides a bulkhead bushing with special gasketing material capable of operation under severe and unique environmental conditions. Holes in the hex accommodate safety wires to withstand vibration.



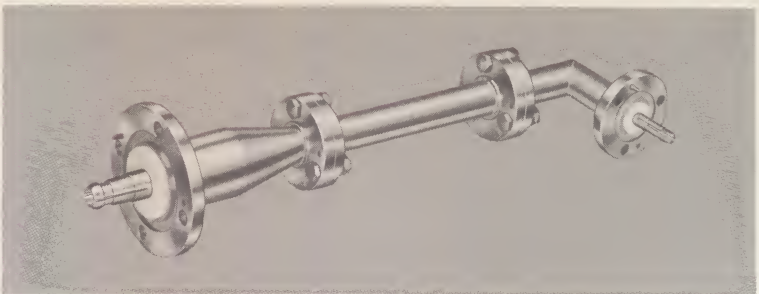
One of a set of four antenna feed assemblies fabricated of copper sheathed 1/2", 50 ohm Foamflex coaxial cable, fitted with type HN connectors. These feeds are matched to within two electrical degrees, of a standard, at L band frequencies. Other environmental conditions must include 2" of radial ice, blowing rain up to 2" per hour and altitudes of 15,000'.



Extreme flexibility is a feature of the larger assembly. A silver plated, solid copper inner conductor is utilized for better conductivity at high frequencies. High temperature, irradiated solid polyethylene forms a dielectric support. The outer conductor is corrugated brass on phosphor bronze with an ablative coating forming the jacketing material. A silicon rubber sealant is used where the cable joins the connectors. Adapters on either end are designed to provide low VSWR. The short, straight length is similar in design but has a different end-flange arrangement.

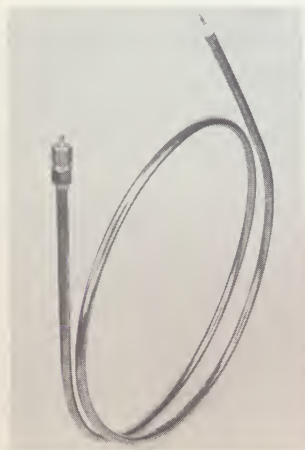


Vibration isolator for airborne use, this extremely flexible corrugated coaxial assembly connects rigid or semi-flexible transmission line to shock-mounted transmitters.

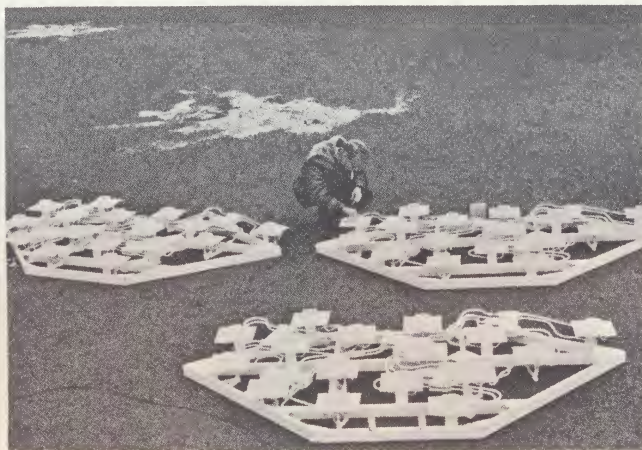


Phelps Dodge Electronics Rigid Line assembly consists of three sections of Seal-O-Flange, EIA, 50 ohm Rigid Line — a reduced taper of 1 5/8" to 7/8", 7/8" line, and 7/8" miter elbow — joined by flanges.

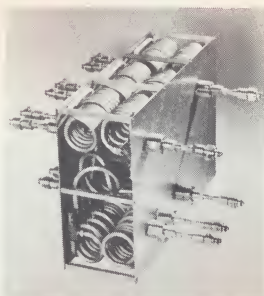
Coaxial Cable Assemblies



The need for easily "bendable" antenna feed assemblies allowing simplified installation on the antenna site lead to the design of this assembly fabricated from 77½ ohm Styroflex® coaxial cable with a special outer conductor of extremely soft copper. The corrosion and weather resistant sheathing is bendable on the job for latitude in installation. These feed cables connect the modules of bat-wing TV antennas. Since each antenna requires a different cable assembly depending on the transmission frequency and antenna configuration, Phelps Dodge Electronics eases customer inventory problems by stocking component parts and shipping completed assemblies on unusually short lead time.



Four quadrant elements comprise the circular antenna in this Avien-Bogner acquisition and tracking antenna. The feed system was planned, fabricated, calibrated and installed by Phelps Dodge Electronics. Accurate uniformity of electrical length for each cable was maintained from cable to cable within one degree at 2,200 megacycles after bending.



The isolation offered by narrow band hybrids fabricated of Phelps Electronics semi-flexible coaxial cables is at least 10 db better than the isolation achieved by broad-band types. In addition to the shielding superiority providing isolation exceeding 40 db, VSWR of less than 1.05, power split within ±.1 db and insertion loss of 3.1 db are important characteristics.

Mechanical length tolerances of ±.002" and bend radii of $\pm\frac{3}{16}$ " are attained without adversely affecting the electrical characteristics of the cable.

Hybrids, phase comparators and power splitters are designed to individual specifications using Phelps Dodge Electronics coaxial cables in diameters ranging from .018" to $\frac{7}{8}$ ", in 50 ohm impedance.



Coaxial Cable Delay Lines

■ Producing delay lines to customer specifications is a highly-developed capability at Phelps Dodge Electronics. These delay lines provide the superior characteristics of Phelps Dodge Electronics aluminum and copper-sheathed, air-dielectric coaxial cables. They can be shaped into almost any configuration required, offer job-proved performance and reliability, are available with Styroflex®, Helical Membrane, Foamflex, Miniature Coax as well as special coaxial cables.

CONFIGURATION: The smallest lightest-weight packages possible are achieved because of the proved ability to shape to a minimum practical radius of three times the sheath diameter to the center line of the bend — without mechanical or electrical distortion. 797 feet of ¼-inch Foamflex cable, for example, may occupy less than ½-cubic foot, weigh as little as 35 pounds, and exhibit 1 microsecond of delay.

PARAMETERS: Delay lines can be fabricated to function within a frequency range of 60 CPS to 12 Gc, power from one milliwatt to many kilowatts, impedances of 50, 70, 75, 100, and 125 ohms. Work within these boundaries allows all the engineering latitude needed in areas of closely calibrated tolerances of delay (calibration in fractions of a nanosecond is standard procedure), as well as attenuation, bandwidth, VSWR, and peak voltage.

TABLE OF CABLE SIZE, PACKAGE SIZE, AND DELAY RATIO
STYROFLEX® • FOAMFLEX

		CABLE SIZE	MICRO- SECOND DELAY	A	C	B	E	F	D
 ROUND		.250	.3 .6 1.0	12	3	2 3½ 5¼	15	12	1½ 3 4¼
 RACE TRACK		.375	.3 .6 1.0	15 ⅞	4½	2 4 6½	18 ⅞	15 ⅞	2 3½ 5½
		.500	.3 .6 1.0	20	6	3 5 8½	23½	20½	2½ 4½ 7½

LENGTH PER MICROSECOND

STYROFLEX®—886'

FOAMFLEX—797'

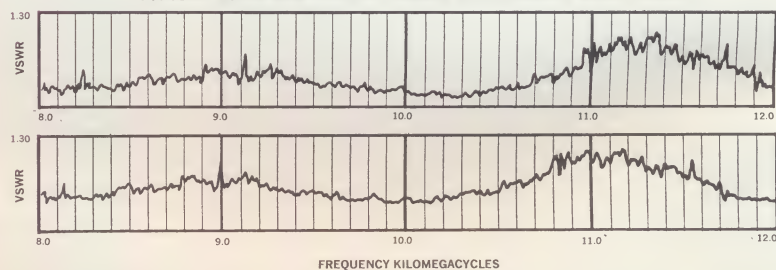
This table shows approximate sizes of delay line packages made from currently available diameters of Phelps Dodge Electronics coaxial cable. The delay times are indicated only to help establish typical package sizes.

All delay lines are designed and produced to meet your individual requirements. Proportions may be varied. Larger cable sizes are available on request.

FOR QUOTATION PURPOSES, SPECIFY:

1. Cable brand name
2. Cable diameter
3. Cable impedance
4. Electrical length
5. Mechanical length
6. Total delay
7. Delay tolerance
8. Physical dimension
9. Weight
10. Packaging
11. Application (if possible)
12. Frequency
13. Attenuation
14. Peak voltage
15. Temperature extremes

TYPICAL VSWR FOR PHELPS DODGE ELECTRONICS DELAY LINES



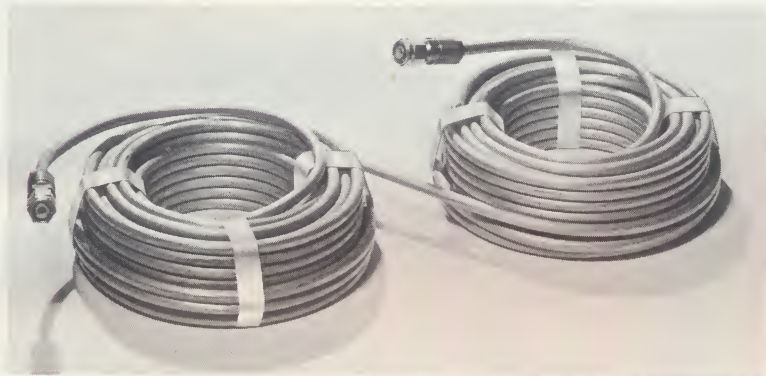
Coaxial Cable Delay Lines

PERFORMANCE: Phelps Dodge Electronics delay lines consistently and uniformly meet delay-accuracy standards as precise as $\pm .02$ nanoseconds. Built-in factors include: broader band operation, higher temperature attenuation stability, lower attenuation per nanosecond of delay, and greater stability at microwave frequencies.

PACKAGING: Flexibility is paramount. All conventional packaging techniques are available: containers, shock mounting, standard rack-panel mounting, strapping, potting, and encapsulating coils

are available with mounting brackets and connectors. They can also be chemically treated, painted, or enclosed in standard or customized racks or carrying cases.

MINIATURIZATION: New miniature Phelps Dodge Electronics coaxial cables add a new dimension to delay line compactness. The cables come in three sizes, .141", .070" and .085", 50 ohm impedance, and in random lengths from 12' to 200'. Constructions consist of a silver plated, Copperweld inner conductor with a Teflon® dielectric and seamless copper sheath.



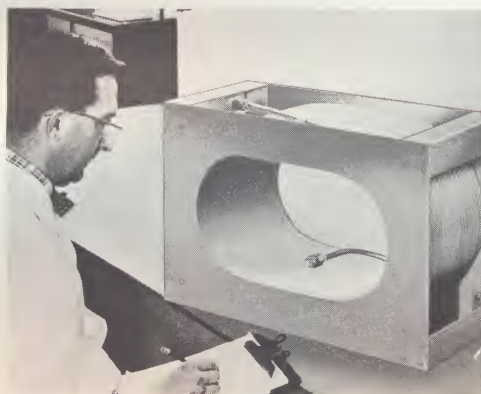
Tandem delay line is used to calibrate radar. Construction consists of .270" irradiated polyethylene cable with an aluminum outer conductor, 50 ohm, with Type TNC Male adapters on each end. It exhibits approximately 150 nanoseconds delay, and is approximately 110 feet long.



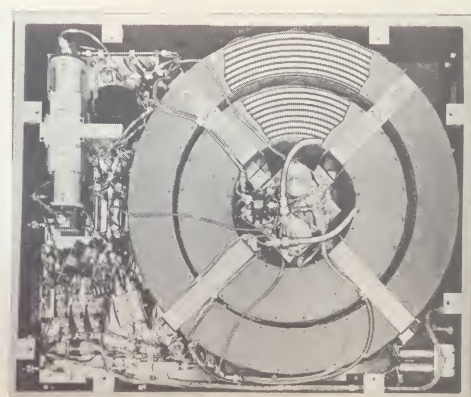
Phelps Dodge Electronics attenuation calibrator can test single channel insertion loss with a high degree of accuracy. Facilities for dual channel testing are also available.



This very small potted "pancake" delay line is mounted directly onto the side of a new type radio altimeter. Only 11" long, 7" wide and $\frac{3}{8}$ " thick, this miniature package exhibits approximately 122 nanoseconds of delay. Cable used is Phelps Dodge Electronics CT-141-50, an extremely flexible miniature coaxial cable with a diameter of .141" and impedance of 50 ohms.

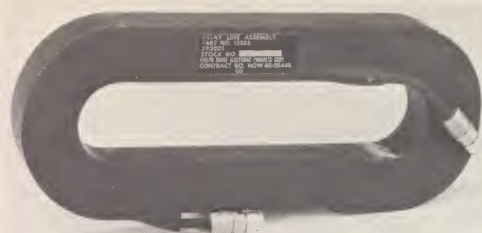


Envelope measuring only 12" by 15" by 26" replaced a 6-foot diameter delay line used in a nuclear application. The Phelps Dodge Electronics package consisted of 50-ohm Styroflex® coaxial cable.



Altitude simulator provides an artificial delay between transmitter and receiver to duplicate earth or sea return for use in calibration of the altimeter and preflight, go-no-go checkout. Attenuation value of the two delay lines within acceptable limits is maintained by a thermostatically controlled heating blanket.

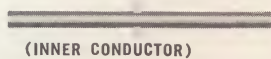
Phelps Dodge Electronics delay package incorporates nine individual delay lines, contains 1500' of $\frac{1}{4}$ "-diameter, 50-ohm Foamflex coaxial cable. Housed in a unit that ground-tests aircraft radar altimeters, the package delivers the required stability and high accuracy.



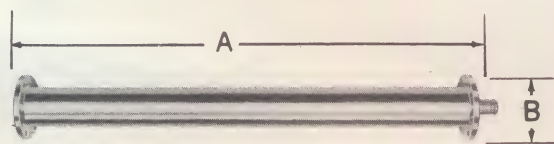
An encapsulated delay line, used between 8 and 12 Gc, exhibits 100 nanoseconds of delay. The overall unit weighs less than 8 pounds and the cable is 70 feet long. The cable is .270" diameter, 50 ohm coaxial cable, with an irradiated polyethylene core. Output connectors are TNC Males.

Rigid Line and Accessories

PART	DESCRIPTION	CATALOG NUMBER	IMPEDANCE	RIGID LINE DIAMETER	DIMENSIONS		
					A	B	C
Transmission Line	20 ft. lengths, flanged both ends (also available in 19 ft. 6 in. lengths)	1-78-50	50	7/8"	20'	2 1/4"	—
		1-158-50	50	1 5/8"	20'	3 1/2"	—
		1-318-50	50	3 1/8"	20'	5 3/16"	—
		1-618-50	50	6 1/8"	20'	8 1/8"	—
		1-618-75	75	6 1/8"	20'	8 1/8"	—
Transmission Line	20 ft. lengths, flanged one end (also available in 19 ft. 6 in. lengths)	2-78-50	50	7/8"	↑ Specify Length ↓	2 1/4"	—
		2-158-50	50	1 5/8"		3 1/2"	—
		2-318-50	50	3 1/8"		5 3/16"	—
		2-618-50	50	6 1/8"		8 1/8"	—
		2-618-75	75	6 1/8"		8 1/8"	—
Transmission Line	20 ft. lengths, no flanges	3-78-50	50	7/8"	↑ Specify Length ↓	—	—
		3-158-50	50	1 5/8"		—	—
		3-318-50	50	3 1/8"		—	—
		3-618-50	50	6 1/8"		—	—
		3-618-75	75	6 1/8"		—	—
90° Miter Elbow	Swivel flanged both ends, female bullet receptacles. Silver plated inner conductor	4-78-50	50	7/8"	2 3/4"	2 3/4"	2 1/4"
		4-158-50	50	1 5/8"	2 1/2"	2 1/2"	3 1/2"
		4-318-50	50	3 1/8"	3 13/16"	3 13/16"	5 3/16"
		4-618-50	50	6 1/8"	6 5/16"	6 5/16"	8 1/8"
		4-618-75	75	6 1/8"	6 5/16"	6 5/16"	8 1/8"
45° Miter Elbow Female	Swivel flanged both ends, female bullet receptacles. Silver plated inner conductor	5-78-50	50	7/8"	2 3/4"	2 3/4"	2 1/4"
		5-158-50	50	1 5/8"	2 1/2"	2 1/2"	3 1/2"
		5-318-50	50	3 1/8"	3 1/2"	3 1/2"	5 3/16"
		5-618-50	50	6 1/8"	5 1/2"	5 1/2"	8 1/8"
		5-618-75	75	6 1/8"	5 1/2"	5 1/2"	8 1/8"
90° Miter Elbow Male	Silver plated inner conductor Swivel flanged both ends	6-78-50	50	7/8"	2"	2"	2 1/4"
		6-158-50	50	1 5/8"	2 3/8"	2 3/8"	3 1/2"
		6-318-50	50	3 1/8"	3 13/16"	3 13/16"	5 3/16"
		6-618-50	50	6 1/8"	5 1/2"	5 1/2"	8 1/8"
		6-618-75	75	6 1/8"	5 1/2"	5 1/2"	8 1/8"
Gas Barrier	With "O" ring and special hardware. Incorporates 1/8" IPS gas inlet port	7-78-50	50	7/8"	3 5/16"	2 1/4"	5/8"
		7-158-50	50	1 5/8"	3 7/8"	3 1/2"	5/8"
		7-318-50	50	3 1/8"	4 7/8"	5 3/16"	7/8"
		7-618-50	50	6 1/8"	6 1/8"	8 1/8"	1 1/8"
		7-618-75	75	6 1/8"	6 1/8"	8 1/8"	1 1/8"
Tee Assembly		8-78-50	50	7/8"	5 1/2"	2 3/4"	—
		8-158-50	50	1 5/8"	5"	2 1/2"	—
		8-318-50	50	3 1/8"	7 5/8"	3 13/16"	—
		8-618-50	50	6 1/8"	12"	6"	—
		8-618-75	75	6 1/8"	12"	6"	—
Female Adapter Female Adapter Reducer Reducer Reducer	7/8" to "N" connector 1 5/8" to "N" connector Flange type, 3 1/8" 50 ohm to 1 5/8" 50 ohm Step, 6 1/8" 50 ohm to 3 1/8" 50 ohm Step, 6 1/8" 75 ohm to 3 1/8" 75 ohm	9-78-50	50	7/8"	4"	2 1/4"	—
		9-158-50	50	1 5/8"	5"	3 1/2"	—
		9-318-50	50	3 1/8"	4 21/32"	5 3/16"	—
		9-618-50	50	6 1/8"	7 1/4"	8 1/8"	—
		9-618-75	75	6 1/8"	7 1/4"	8 1/8"	—
Field Flange	Soft solder type	10-78-50	50	7/8"	1"	2 1/4"	—
		10-158-50	50	1 5/8"	1 1/4"	3 1/2"	—
		10-318-50	50	3 1/8"	2"	5 3/16"	—
		10-618-50	50	6 1/8"	3"	8 1/8"	—
		10-618-75	75	6 1/8"	3"	8 1/8"	—
Field Flange	Ungassed	11-78-50	50	7/8"	1"	2 1/4"	—
		11-158-50	50	1 5/8"	1 1/4"	3 1/2"	—
		11-318-50	50	3 1/8"	1 11/16"	5 3/16"	—
		11-618-50	50	6 1/8"	3"	8 1/8"	—
		11-618-75	75	6 1/8"	3"	8 1/8"	—
Anchor Connector Assembly	EIA	12-78-50	50	7/8"	2 11/16"	.810"	3/16"
		12-158-50	50	1 5/8"	3 1/4"	1.645"	1/4"
		12-318-50	50	3 1/8"	4 1/4"	3.195"	3/8"
		12-618-50	50	6 1/8"	5 1/2"	6.055"	7/16"
		12-618-75	75	6 1/8"	5 1/2"	6.055"	7/16"
Flange	Fixed for silver brazing; includes silver solder preform ring	13-78-50	50	7/8"	2 1/4"	—	—
		13-158-50	50	1 5/8"	3 1/2"	—	—
		13-318-50	50	3 1/8"	5 3/16"	—	—
		13-618-50	50	6 1/8"	8 1/8"	—	—
		13-618-75	75	6 1/8"	8 1/8"	—	—
"O" ring gasket		14-78-50	50	7/8"	—	—	—
		14-318-50	50	3 1/8"	—	—	—
		14-618-50	50	6 1/8"	—	—	—
		14-618-75	75	6 1/8"	—	—	—
Cover Plate		15-78-50	50	7/8"	2 1/4"	—	—
		15-158-50	50	1 5/8"	3 1/2"	—	—
		15-318-50	50	3 1/8"	5 3/16"	—	—
		15-618-50	50	6 1/8"	8 1/8"	—	—
		15-618-75	75	6 1/8"	8 1/8"	—	—
Slotted Coupling		16-158-50	50	1 5/8"	2 1/4"	—	—
		16-318-50	50	3 1/8"	3 1/4"	—	—
Reducer, Taper	1 5/8" 50 ohm to 7/8" 50 ohm	17-158-50	50	1 5/8"	4 27/64"	3 1/2"	2 1/4"
Reducer, Taper	3 1/8" 50 ohm to 1 5/8" 50 ohm	17-318-50	50	3 1/8"	7 3/32"	5 3/16"	3 1/2"
Reducer, Taper	6 1/8" 50 ohm to 3 1/8" 50 ohm	17-618-50	50	6 1/8"	8 1/4"	8 1/8"	5 3/16"
Reducer, Taper	6 1/8" 75 ohm to 3 1/8" 75 ohm	17-618-75	75	6 1/8"	8 1/4"	8 1/8"	5 3/16"
Flange	Swivel, for silver brazing	18-78-50	50	7/8"	2 1/4"	—	—
		18-318-50	50	3 1/8"	5 3/16"	—	—
		18-618-50	50	6 1/8"	8 1/8"	—	—
		18-618-75	75	6 1/8"	8 1/8"	—	—

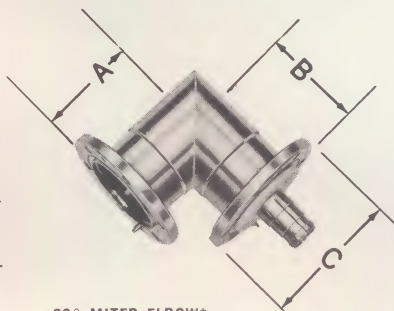


(INNER CONDUCTOR)



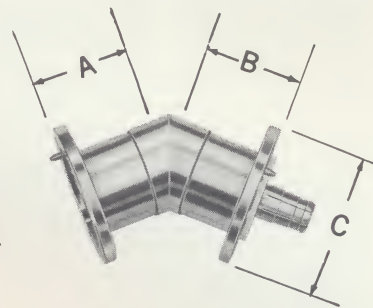
TRANSMISSION LINE*

All catalog numbers beginning with 1, 2, and 3



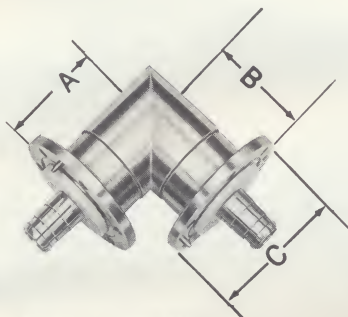
90° MITER ELBOW*

4-78-50 4-158-50 4-318-50 4-618-50 4-618-75



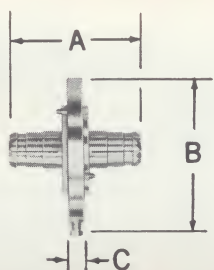
45° MITER ELBOW, FEMALE*

5-78-50 5-158-50 5-138-50 5-618-50 5-618-75



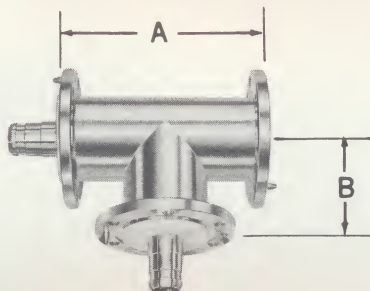
90° MITER ELBOW, MALE*

6-78-50 6-158-50 6-138-50 6-618-50 6-618-75



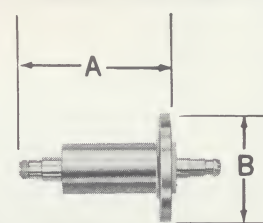
GAS BARRIER*

7-78-50 7-158-50 7-318-50 7-618-50 7-618-75



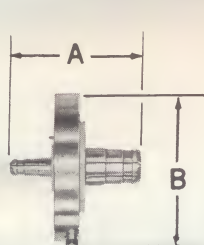
TEE ASSEMBLY*

8-78-50 8-158-50 8-318-50 8-618-50 8-618-75



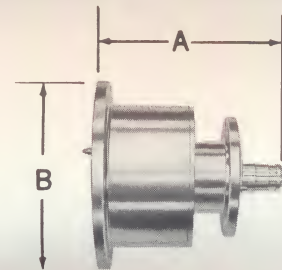
FEMALE ADAPTER*

9-78-50 9-158-50



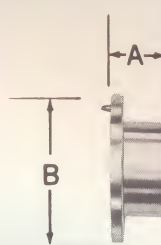
REDUCER*

9-318-50



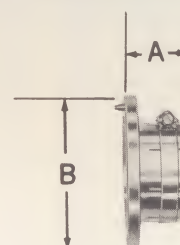
REDUCER*

9-618-50 9-618-75



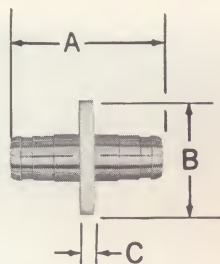
FIELD FLANGE*

10-78-50 10-158-50 10-318-50 10-618-50 10-618-75



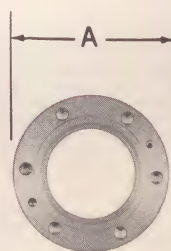
FIELD FLANGE*

11-78-50 11-158-50 11-318-50 11-618-50 11-618-75



ANCHOR CONNECTOR ASSEMBLY

12-78-50 12-158-50 12-318-50 12-618-50 12-618-75



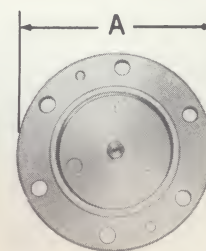
FLANGE

13-78-50 13-158-50 13-318-50 13-618-50 13-618-75



"O" RING GASKET

14-78-50 14-318-50 14-618-50 14-618-75



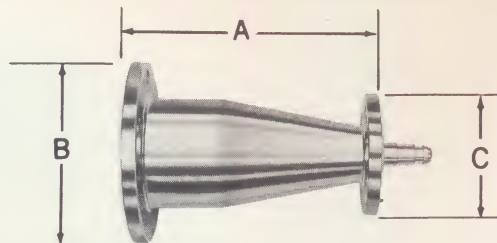
COVER PLATE

15-78-50 15-158-50 15-318-50 15-618-50 15-618-75



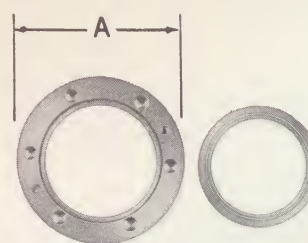
SLOTTED COUPLING

16-158-50 16-318-50



REDUCER, TAPER*

17-158-50 17-318-50 17-618-50 17-618-75

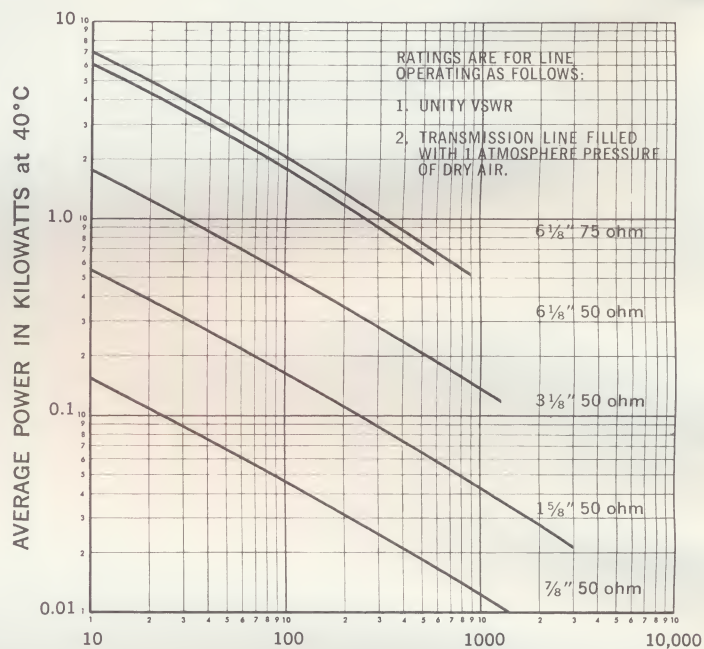
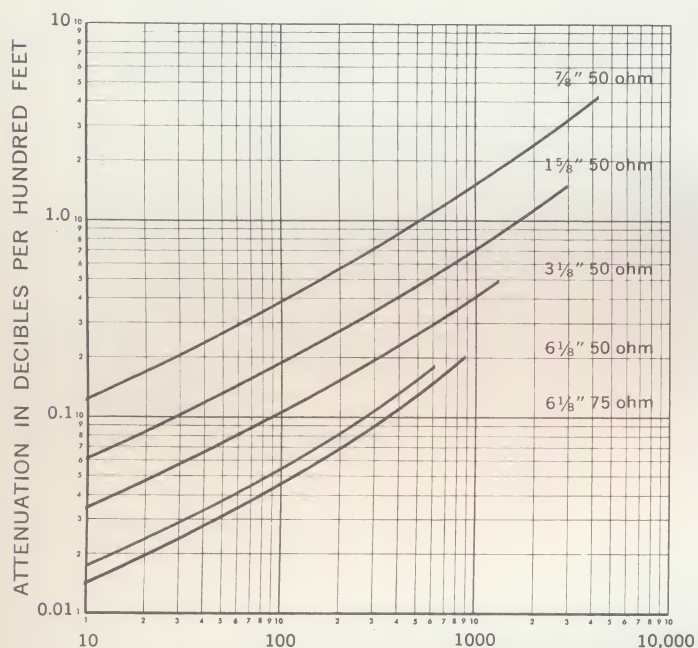


FLANGE

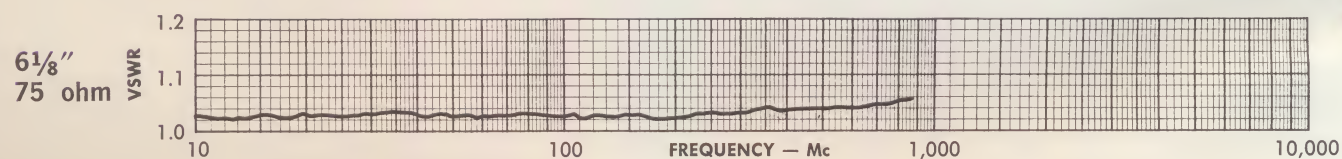
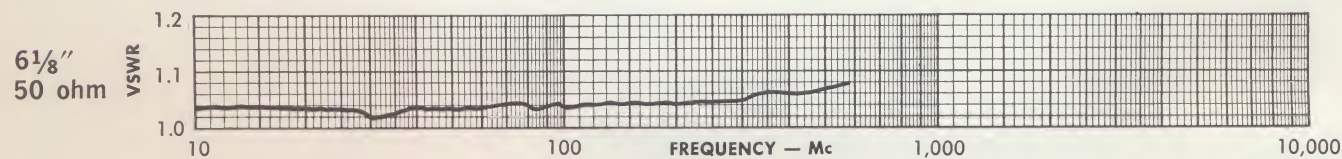
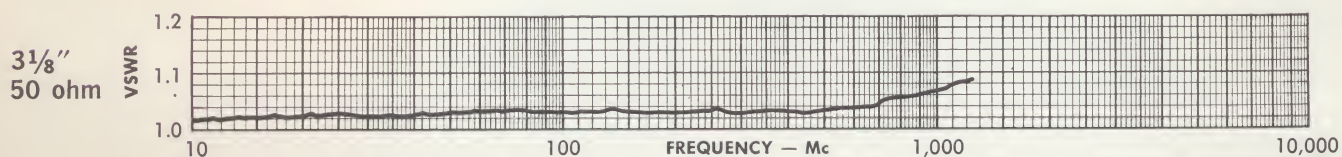
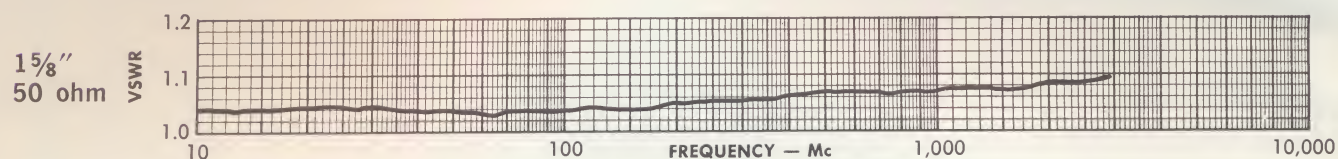
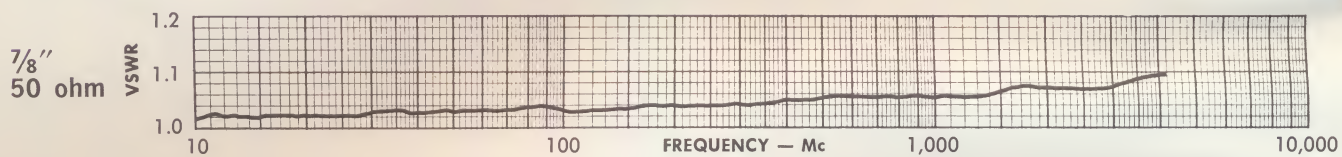
18-78-50 18-318-50 18-618-50 18-618-75

*Bolts and "O" Rings are included in price of accessory. Anchor Connector Assembly supplied where shown.

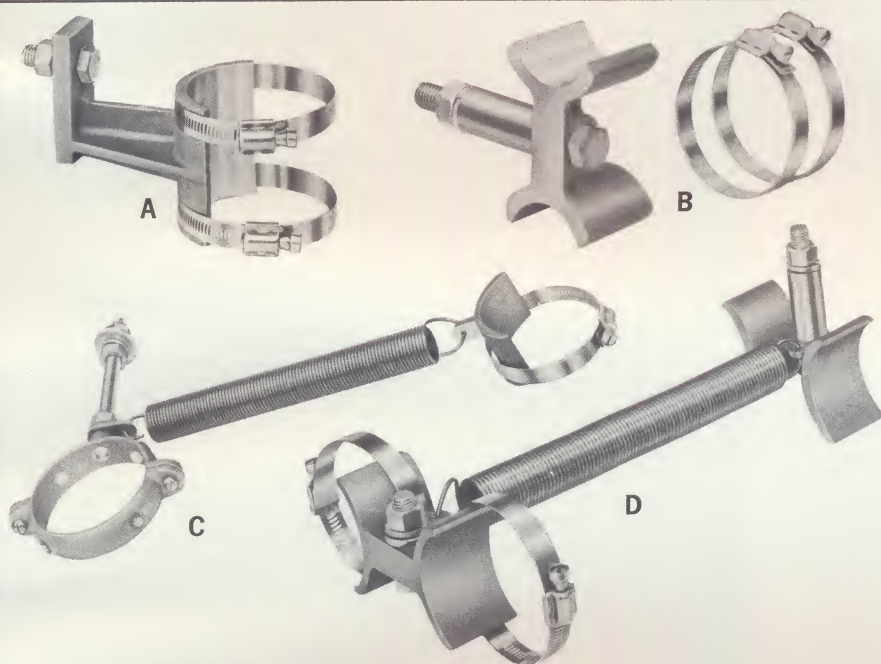
Rigid Line Performance Data



typical VSWR curve for 100 ft. of transmission line



Supporting Hardware For Rigid Line



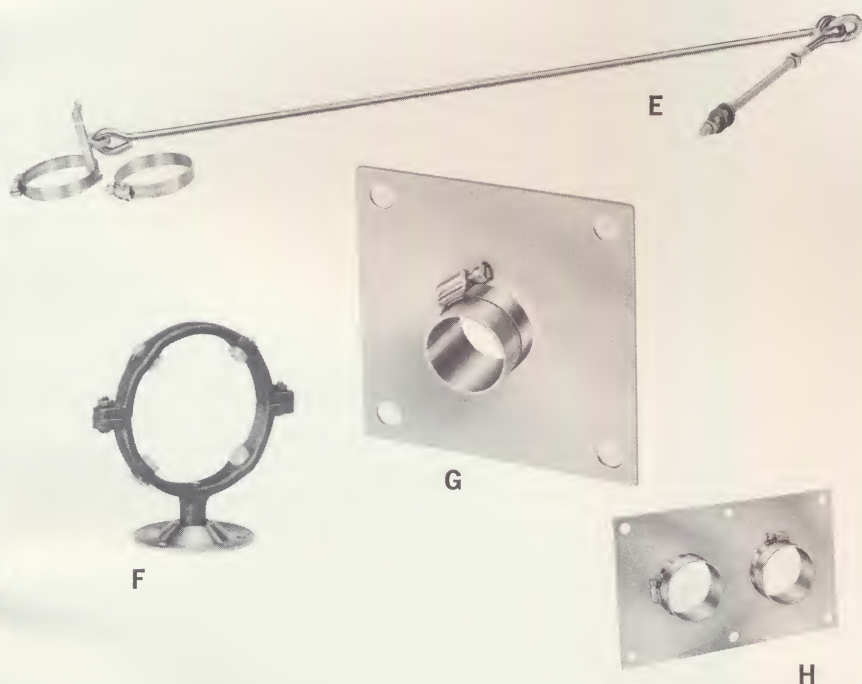
A. ANCHOR FITTING — For fastening the top of single transmission line runs rigidly to tower.

B. ANCHOR FITTING, DUAL — For fastening the top of dual transmission line runs rigidly to tower.

C. HANGER, SPRING TYPE — For supporting the weight of vertical single transmission line runs. Use one every 10 ft. — Note: On $\frac{7}{8}$ " line — 5' spacing is required.

D. HANGER, SPRING TYPE-DUAL — For supporting the weight of vertical dual transmission line runs. Use one every 10 ft.

LINE SIZE	A ANCHOR FITTING CAT. NO.	B ANCHOR FITTING DUAL CAT. NO.	C HANGER SPRING- TYPE CAT. NO.	D HANGER SPRING-TYPE DUAL CAT. NO.	E LATERAL BRACE CAT. NO.	F HORIZONTAL SUPPORT CAT. NO.	G BULKHEAD FITTING CAT. NO.	H BULKHEAD FITTING DUAL CAT. NO.
$\frac{7}{8}$	51-78		91-78		131-78	71-78	111-78	141-78
$1\frac{5}{8}$	51-158	81-158	91-158	101-158	131-158	71-158	111-158	141-158
$3\frac{1}{8}$	51-318	81-318	91-318	101-318	131-318	71-318	111-318	141-318
$6\frac{1}{8}$	51-618		91-618		131-618	71-618	111-618	141-618



E. LATERAL BRACE — For securing transmission line at tower base.

F. HORIZONTAL SUPPORT — For supporting horizontal runs of transmission line.

G. BULKHEAD FITTING — For anchoring horizontal runs of transmission line where they enter a building or cabinet.

H. Same as G except for Dual runs.

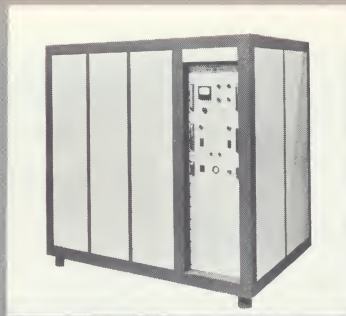
COAXIAL CABLE: TOTAL CAPABILITY

■ Phelps Dodge Electronics capability in the coaxial cable field extends beyond the production of cable in bulk or the availability of custom lengths and special assemblies. These conventional parameters have been widened to include the development of extremely high performance cables and cable systems designed to meet individual needs demanded by unusual environmental or operating conditions. As an example of this total capability, recent work has resulted in the origination of new phase stable cables demonstrating a change of approximately 1 part per million per degree Fahrenheit. These cables, used to carry signals from phased array radar antenna elements exhibit a preciseness in electrical length which greatly minimizes inaccurate data or triangulation, and eliminates the need for constant calibration of antenna elements to compensate for daily temperature changes.

Within this broad "total" capability is the more specialized, unique ability to test and measure cable to a degree never before attainable. Current state-of-the-art permits measurement to the following accuracies:

<i>Parameter</i>	<i>Accuracy</i>
Delay Time	.02 NS
Phase Length	0.4° relative
VSWR	1.01
Insertion Loss	0 to 40 db \pm 0.5 db 40 to 60 db \pm 1.0 db
Impedance	absolute value of average impedance 1 %
Impedance Discontinuities	0.2%

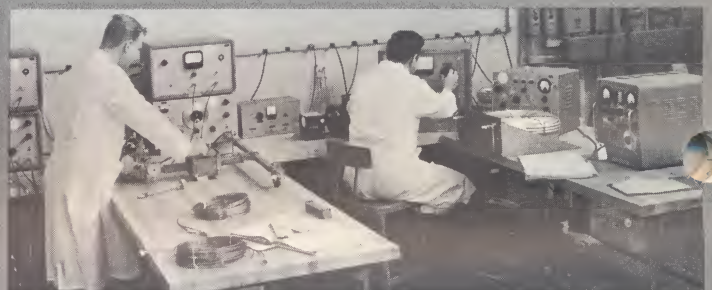
If the problem involves coaxial cable, the solution may well rest with Phelps Dodge Electronic Products Corporation. Your inquiries are most welcome.



This highly sophisticated pulse power module is a high energy system that meets the most diverse pulse power requirements. It provides a capability for magnetic forming and electrical testing (RFI, high current conduction). The completely self-contained unit is rated at 50 kilojoules at the maximum operating potential of 20 KV. Peak currents in excess of 1.5 megamperes are obtained at a maximum ringing frequency of 45 kilocycles.



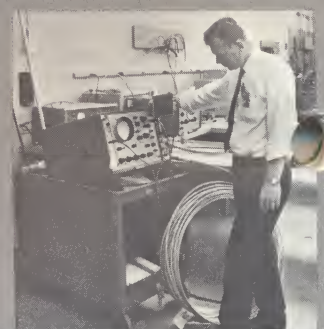
This radio direction finder is typical of phased array antennas requiring phase stable cables for maximum operating efficiency. The new measuring techniques developed by Phelps Dodge Electronics permit development of cables with a minimum change of electrical length with change in temperature. A change of electrical length of 5 parts per million per °F has been achieved.



Phelps Dodge Electronics 500 nanosecond standard delay line, right, is being measured for electrical length with an RF Phase Comparison bridge. The electrical length may be measured to within 1° at 1 KMC. The operator at the left is conducting sweep measurement of voltage standing wave ratio. This setup is a standard reflectometer system utilizing one directional coupler detector combination to monitor the incident wave at the cable under test, while the other monitors the wave reflected from the cable. A plot of the VSWR characteristic of the cable as a function of frequency is obtained and recorded.



Cable evaluation under temperature extremes (-120°F to 450°F) is conducted within the Phelps Dodge Electronics laboratories. Electrical length, voltage standing wave ratio, attenuation measurements can all be made under widely varying ambient temperatures. Equipment to the left is a Phelps Dodge Electronics pulser used for electrical length measurements.



Time Domain Reflectometry, the latest development in transmission line analysis, separates and defines discontinuities to permit better coaxial cable construction, forming techniques and connector design.

ENGINEERING COMPUTATION METHODS

Determination of Cable Size

The selection of the correct size of coaxial cable to be used is governed by three factors: Voltage breakdown, Power Rating and required Attenuation.

When the attenuation of the system is the only factor to be considered, the cable size can be selected knowing the impedance, operating frequency and the length of cable to be used. The selection of the correct cable size can then be determined from the attenuation curves which are given for the Phelps Dodge Electronic Products Corporation's line of coaxial cables.

For other applications, the transmission system must be capable of handling both the average power output and the peak voltage of the transmitter. The procedure for the selection of the correct cable size is as follows:

A. Determine the average power output (P_o) from the transmitter by multiplying the unmodulated carrier power by the appropriate modulation factor.

Transmission Mode	Modulation Factor
Continuous Mode — (CW)	1
Frequency Modulation — (FM)	1
Television	1.1
Amplitude Modulation — (AM) (100 percent)	1.5

For Radar and Pulse applications the cable size is dependent on peak voltage and duty cycle. Multiply the duty cycle by the transmitter power to find the average power output.

B. Calculate the effective power input (P_{eff}) to the cable by multiplying the average output power (P_o) found in step (A) by the input VSWR of the system.

$$P_{eff} = P_o \times VSWR$$

Where

P_o = average transmitter power output
VSWR = Voltage standing wave ratio of the system

C. Determine the cable size which will carry the effective power input to the cable at the operating frequency, by comparing P_{eff} to the power rating curves for the PDE coaxial cables.

D. Calculate the peak voltage on the cable.

E. Refer to the Electrical Characteristics of PDE coaxial cables to determine the smallest cable size that will handle the peak voltage (E_{peak}) calculated in step (D).

F. Select the larger of the two cable sizes determined in steps (C) and (E).

ture to determine the correct cable size from power rating and voltage breakdown requirements. The power rating of a transmission line is defined as that power which can be transmitted without excessive temperature rise or without voltage flashover. The fact that the actual power rating of a system may be limited by the characteristics of the terminal equipment, connectors, type of installation rather than by the cable itself should be considered. If any doubt concerning the feasibility of using PDE cables exists, the engineering department should be consulted.

Useful Formulas for Coaxial Lines — High Frequency Formulas

$$\text{Capacitance} = \frac{K_r}{59.1 \times L_n d_2/d_1} \times 10^{-9} \text{ farads/foot}$$

$$\text{Inductance} = 0.061 L_n d_2/d_1 \text{ microhenries/foot}$$

$$\text{Impedance} = \frac{60}{\sqrt{K_r}} L_n d_2/d_1 = \sqrt{\frac{L}{C}}$$

$$\text{Velocity of Propagation} = \frac{3 \times 10^{10}}{\sqrt{K_r}} \text{ cm/sec.}$$

$$\text{Delay Time} = 1.02 \sqrt{K_r} \times 10^{-9} \frac{\text{sec.}}{\text{Foot of cable}}$$

$$\text{Cutoff Frequency} = \frac{6.75 Kmc}{\sqrt{K_r} (d_1 + d_2)} = 90\% F_{co}$$

$$\text{Reflection Coefficient} = \Gamma = \frac{Z_1 - Z_2}{Z_1 + Z_2} = \frac{VSWR - 1}{VSWR + 1}$$

$$VSWR = \frac{1 + \Gamma}{1 - \Gamma}$$

$$\text{Peak Voltage} = \frac{G}{S} \times 0.50 \times d_1 L_n d_2/d_1$$

Where

d_1 is the outer diameter of the inner conductor in inches
 d_2 is the inner diameter of the outer conductor in inches

Where

C is capacitance
G is the maximum voltage gradient of the cable insulation in volts per mil.
 K_r is the dielectric constant of the cable
L is inductance
 L_n is natural logarithmic base
S is a safety factor
Z is impedance

For Pulse Cable applications the maximum voltage gradient will be based on the impulse strength of the insulation as long as the pulse does not reverse polarity. For optimum design of pulse cables, Phelps Dodge engineering department should be consulted.





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